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NOVEMBER 11TH, 1884.

Professor W. H. FLOWER, LL.D., F.R.S., *President, in the Chair.*

The Minutes of the last meeting were read and signed.

The following presents were announced, and thanks voted to the respective donors:—

FOR THE LIBRARY.

- From BARON FERD. VON MUELLER.—On Plants used by the Natives of North Queensland, Flinders and Mitchell Rivers for Food, Medicine, &c. By Edward Palmer.
- From the SECRETARY OF STATE IN COUNCIL OF INDIA.—The Indian Empire. Census of 1881. 3 Vols.
- From the PRESIDENT OF THE UNIVERSITY OF TOKIO.—Okadaira Shell Mound at Hitachi. By I. Iijima and C. Sasaki.
- From the SECRETARY OF THE COMMONWEALTH, MASSACHUSETTS.—Forty-second Report to the Legislature of Massachusetts for the year 1883.
- From the ASSISTANT CURATOR OF THE GOVERNMENT CENTRAL MUSEUM OF MADRAS.—Report on the Working of the Museum for 1883–1884.
- From DR. EMIL RIEBECK.—Die Sammlung des Herrn Dr. Emil Riebeck.
- From GEORGE W. BLOXAM, M.A.—Proceedings of the Athenæum Society. Nos. 1, 2.

- From the AUTHOR.—A new Stand for Skulls made by Edward E. Chick. By F. W. Putnam.
- Abnormal Human Skulls from Stone Graves in Tennessee. By F. W. Putnam.
- Remarks upon the Antiquity of Man in America. By F. W. Putnam.
- Circular relative to Contributions of Aboriginal Antiquities to the U.S. National Museum. By Charles Rau.
- New points in the History of Roman Britain, as illustrated by Discoveries at Warwick Square, within the City of London. By Alfred Tylor, Esq.
- Allgemeine Grundzüge der Ethnologie. By Dr. Adolf Bastian.
- Scientific Basis of Eclecticism in Medicine. By C. A. F. Lindorme, Ph.D., M.D.
- Mémoire sur quelques points de Tératogénie en réponse a un travail récent de MM. Fol et Warynski. By Camille Dareste.
- An Examination of the Trade Dialect of the Naqqash or Painters on Papier-maché in the Punjáb and Kashmir. By Capt. R. C. Temple, B.S.C.
- The Social and Political Position of Women among the Huron-Iroquois Tribes. By Lucien Carr.
- Selish Myths. By W. J. Hoffman, M.D.
- On the Implementiferous Gravels near London. By T. Rupert Jones, F.R.S.
- Sur la valeur Morphologique de la Trompe d'Eustache, &c. By M. le Prof. Paul Albrecht.
- Sur les Spondylocentres Epipituitaires du Crane, &c. By M. le Prof. Paul Albrecht.
- A Manual of the Nilagiri District in the Madras Presidency. By H. B. Grigg, B.A.
- On some Vestiges of Roman Occupation between West Hartlepool and Seaton Carew. By R. Morton Middleton, Junior, F.L.S.
- Antiquity of Man as deduced from the Discovery of a Human Skeleton at Tilbury, North Bank of the Thames. By Sir Richard Owen, K.C.B.
- New Guinea Bibliography. By E. C. Rye.
- The Social Emancipation of the Gipsies. By James Simson.
- Extract from the Zoological Results of the Voyage of H.M.S. Alert. 1878-82. Mammalia. By Oldfield Thomas.
- Sujets décoratifs empruntés au règne animal dans l'Industrie Gauloise. By M. le Baron Joseph De Baye.
- Héredite de la Couleur des Yeux dans l'espèce humaine. By M. Alph. de Candolle.
- Proben der Sprache von Ghât in der Sáhārā mit haussanischer und deutscher Uebersetzung. By Gottlob Adolf Krause.
- The Sugar Industry in Queensland. By H. Ling Roth.
- From the ROYAL ASIATIC SOCIETY, CEYLON BRANCH.—Translations from the Páli of Játakas 41-50. By the Lord Bishop of Colombo.

- From the DEUTSCHE GESELLSCHAFT FÜR ANTHROPOLOGIE, &c.—Archiv für Anthropologie. Band XV, 3.  
 — Correspondenz Blatt. June—August, 1884.  
 From the SOCIETY OF ANTIQUARIES.—Archæologia, Vol. XLVIII.  
 From the SOCIEDADE DE GEOGRAPHIA DE LISBOA.—Expedição Científica à Serra da Estrella em 1881. (1) Secção de Medicina Subsecção de Ophthalmologia. (2) Secção de Archeologia. (3) Secção Ethnographia.  
 — Le Zaire et les contrats de l'Association Internationale. By C. Magalhães  
 — Plantas uteis da Africa Portuguesa. By Conde de Ficalho.  
 From the SOCIETÀ ITALIANA DI ANTROPOLOGIA.—Archivio per l'Antropologia e la Etnologia. Vol. XIV, Fas. 1.  
 From the GEOGRAPHICAL SOCIETY OF THE PACIFIC.—Arctic Drift and Ocean Currents. By Charles Wolcott Brooks.  
 From the SMITHSONIAN INSTITUTION.—Smithsonian Report, 1882.  
 From the DEVONSHIRE ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—The Devonshire Domesday. Part I.  
 — Report and Transactions. Vol. XVI.  
 From the SOCIETÀ GEOGRAFICA ITALIANA.—Terzo Congresso Geografico Internazionale. Vol. II.  
 From the BERLINER GESELLSCHAFT FÜR ANTHROPOLOGIE.—Zeitschrift für Ethnologie 1884. Heft. 3.  
 From the BATAVIAASCH GENOOTSCHAP VAN KUNSTEN EN WETENSCHAPPEN.—Tijdschrift voor indische Taal-, Land- en Volkenkunde. Deel. XXIX, Afl. 2, 3.  
 From the LEEDS PHILOSOPHICAL AND LITERARY SOCIETY.—The Annual Report for 1883-4.  
 From the ACADEMY.—Atti della R. Accademia dei Lincei, Transunti, Vol. VIII. Fas. 11-15.  
 — Bulletin de l'Académie Impériale des Sciences de St. Pétersbourg. Tom. XXIX.  
 From the ASSOCIATION.—Journal of the East India Association. Vol. XVI, Nos. 4-6.  
 — Journal of the Royal Historical and Archæological Association of Ireland. No 57.  
 From the INSTITUTE.—Proceedings of the Royal Colonial Institute. Vol. XV.  
 — Transactions and Proceedings of the New Zealand Institute. Vol. XVI.  
 Proceedings of the Canadian Institute. Vol. II, Fas. 2, 3.  
 From the INSTITUTION.—Journal of the Royal United Service Institution. Nos. 124, 125.  
 — Journal of the Royal Institution of Cornwall. Vol. VIII, Part 2.  
 From the SOCIETY.—Proceedings of the Royal Society. Nos. 231, 232.  
 — Journal of the Society of Arts. Nos. 1630-1660, 1663, 1664, 1666, 1667.  
 — Proceedings and Transactions of the Royal Society of Canada. Vol. I.

- From the SOCIETY.—Schriften der Physikalisch-ökonomischen Gesellschaft zu Königsberg. 1883, Abth. 1, 2.
- Mémoires de la Société d'Emulation d'Abbeville. 3<sup>e</sup> Ser. 3<sup>e</sup> Vol.
- Bulletins de la Société d'Anthropologie de Paris. 1884, Fas. 2, 3.
- Bulletin de la Société de Borda, Dax. 1884, 2, 3.
- Proceedings of the Royal Geographical Society. 1884, July—November.
- Boletim da Sociedade de Geographia de Lisboa. Nos. 6—9.
- Bulletin de la Société d'Anthropologie de Bruxelles. Tom. II, Fas. 1, 2.
- Proceedings of the Royal Society of Edinburgh. Sessions 1881—82, 1882—83.
- Transactions of the Royal Society of Edinburgh. Vol. XXX, Parts 2, 3; Vol. XXXII, Part 1.
- The Scientific Proceedings of the Royal Dublin Society. Vol. III, Parts 6, 7; Vol. IV, Parts 1—4.
- Papers and Proceedings of the Royal Society of Tasmania. 1882, 1883.
- Proceedings of the Society of Biblical Archæology. Vol. VI.
- Journal of the Asiatic Society of Bengal. No. 258.
- Proceedings of the Asiatic Society of Bengal. 1884, Nos. 3—5.
- Royal Asiatic Society (Ceylon Branch). Proceedings, 1883, and Addenda to Prof. Rhys Davids' Translation of the Jâtakas, 1—40.
- Transactions of the Asiatic Society of Japan. Vol. XII, Parts 2, 3.
- Proceedings of the Philosophical Society of Glasgow. Vol. XV.
- Proceedings of the American Philosophical Society. No. 115.
- Constitution of the Anthropological Society of Washington.
- Bulletin de la Société d'Anthropologie de Lyons. 1883, 1.
- Bulletin de la Société Impériale des Naturalistes de Moscou 1883, 4; 1884, 1.
- Dreiundzwanzigster Bericht der Oberhessischen Gesellschaft für Natur-und Heilkunde.
- Verhandeligen van het Bataviaasch Genootschap van Kunsten en Wetenschappen. Deel. XLIV.
- VI, Jahresbericht der Geographischen Gesellschaft von Bern. 1883—84.
- Notulen van de Algemeene en Bestuurs-vergaderingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen. Deel. XXI, Nos. 3, 4.
- Procédings of the Geographical Society of the Pacific. 1884.
- From the EDITOR.—Bullettino di Paletnologia Italiana. Anno. 10, N. 3—6.
- Journal of Mental Science. Nos. 94, 95.
- Matériaux pour l'Histoire de l'Homme. 1884, June—October.
- "Nature." Nos. 765—767, 769—782.



- From the EDITOR.—*Revue d'Anthropologie.* 1884, Parts 3, 4.  
—— *Revue d'Ethnographie.* 1884, Nos. 2, 3.  
—— *Revue Politique.* Tom. XXXIII, Nos. 25, 26; Tom. XXXIV, Nos. 1-18.  
—— *Revue Scientifique.* Tom. XXXIII, Nos. 25, 26; Tom. XXXIV, Nos. 1-18.  
—— "Science." Nos. 71-76, 78-89.  
—— *The Illustrated Science Monthly.* Vol. II, Nos. 9-11.  
—— *Timehri.* Vol. III, Part I.  
—— *American Antiquarian.* Vol. VI, No. 4.
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The election of the following new Members was announced:—  
Mrs. ERMINNIE A. SMITH; F. A. COLBY, Esq., M.D.; HORATIO HALE, Esq., and D. H. TALBOT, Esq.

Mr. FRANCIS GALTON exhibited and described a collection of composite photographs of skulls, made by Dr. Billings, of the United States, which he presented to the Institute.

Mr. H. O. FORBES read some "Ethnological Notes on the "People of the Island of Buru."

The following paper was read by the author:—

*On the ANTHROPOMETRIC LABORATORY at the late INTERNATIONAL HEALTH EXHIBITION.* By FRANCIS GALTON, M.A., F.R.S.

[WITH PLATES XII AND XIII.]

Now that the International Health Exhibition is over, and the Anthropometric Laboratory there established has done its appointed work, it is desirable to put on record its methods and experiences. As for the statistical results they are still under discussion and I shall not speak of them now, but I hope before long to communicate these also to the Institute.<sup>1</sup>

The object of the laboratory was to show to the public the simplicity of the instruments and methods by which the chief physical characteristics of man may be measured and recorded. The instruments in action dealt with keenness of sight; colour-sense; judgment of eye; hearing; highest audible note; breathing power; strength of pull and squeeze; swiftness of blow; span of arms; height, standing and sitting; and weight. Some other apparatus not in actual use was also exhibited.

The chief motive of this memoir is to invite criticism and

<sup>1</sup> A general statement of the results is printed among the "Miscellanea" at the end of this number of the Journal.

suggestions. Duplicates of the instruments have been ordered by executive officers in foreign countries, and considerable interest has been expressed in the collection by the authorities of many places of education in this country, as well as by numerous private individuals. It seems, therefore, well to lose no time in considering whether any and what improvements should be made in their scope and design before they or any others may be so widely used that it would become difficult to make a change. We want a set of standard apparatus of as appropriate a pattern as can be devised, for the sake of uniformity in the methods of measurement and facility in statistical comparisons. I have therefore brought all my instruments to this room, together with the attendants who had charge of them in the Exhibition, availing myself very gladly of the opportunity afforded by this meeting of submitting my method and appliances to discussion.

The number of persons measured in the laboratory from first to last was no less than 9,337, and each of them in 17 different ways. The only attendants were Serjeant Williams, who was permanently on duty, Mr. Gammage (optical instrument maker, 172, Brompton Road), who came for some hours every evening to assist and supervise, and who maintained the instruments in efficiency, and a doorkeeper provided by the executive, who admitted visitors, received the admission fee of 3*d.*, supplied the blank forms, and saw that the required particulars were written down by them. The doorkeeper also made himself useful in many other details. With this small staff, and in a compartment only 6 feet wide and 36 feet long, about ninety persons were measured daily in an elaborate manner.

It was not possible to work so rapidly at first, but the process gradually improved. Thus it was found best to take two persons through the laboratory together at the same time, and to keep parents and their children apart, as the old did not like to be outdone by the young, and insisted on repeated trials.

Hardly any trouble occurred with the visitors, though on some few occasions rough persons entered the laboratory who were apparently not altogether sober. On the whole, the laboratory worked with astonishing smoothness, and its popularity was extraordinary. Its door was thronged by applicants waiting patiently for their turn, or after a while turning away seeing that it was almost a hopeless task to wait. If there had been more accommodation there would have been a large increase in the number measured. The small admission fee of 3*d.* did more than cover every charge connected with the maintenance of the laboratory and I have therefore little doubt that a smaller number of careful measurements might be made periodically at

large schools under skilled supervision for a very minute charge per head, if the system of doing so was well methodised, and if the masters, older pupils, and school attendants gave willing help.

There is a vast field for work among the millions of school boys and girls of all degrees, with the object of keeping an adequate oversight upon their physical well-being by a judicious series of physical measurements. I do not see why it should be either difficult or costly to the schools of the upper and middle classes, to whom a charge of two or three pence per head is a matter of no moment whatever, to institute periodical measurements even of a somewhat elaborate character under skilful itinerant supervision, and to register them in a methodical and uniform manner. It should, I think, become a recognised part of school discipline to have this regularly done; the more so as the experience of this laboratory, confirmed by those of many American colleges, makes it certain that the innovation would be popular. One of the conditions that a standard set of instruments ought to fulfil is, that it should admit of being readily packed, carried about from place to place, and quickly set up anywhere for temporary use by a professional measurer.

We have now to consider what we should measure. One object is to ascertain what may be called the personal constants of mature life. This phrase must not be taken in too strict a sense, because there is nothing absolutely constant in a living body. Life is a condition of perpetual change. Men are about half an inch shorter when they go to bed than when they rise in the morning. Their weight is affected by diet and habit of life. All our so-called personal constants are really variables, though a large proportion of their actual variations may lie between narrow limits. Our first rule then is, that the trouble of measurement is best repaid when it is directed upon the least variable faculties.

There are many faculties that may be said to be potentially constant in adults though they are not developed, owing to want of exercise. After adequate practice, a limit of efficiency would in each case be attained, and this would be the personal constant; but it is obviously impossible to guess what that constant would be from the results of a single trial. No test professes to do more than show the efficiency of the faculty at the time it was applied, and many tests do even less than this, being so novel to the person experimented on that he is maladroit, and fails to do himself justice; consequently the results of earlier trials with ill-devised tests may differ considerably from those of later ones. The second rule then is, that the actions required by the tests should be as familiar as possible.

For example, in testing the delicacy of the various senses I think we should do wrong if we pursued the strict methods appropriate to psycho-physical investigations. We do not want to analyse how much of our power of discriminating between two objects is due to this, that, or the other of the many elementary perceptions called into action. It is the total result that chiefly interests us. Thus in measuring the delicacy with which a person can estimate the difference between weights, I think he ought to be allowed to handle them in the way he prefers and that we may disregard the fact that his judgment rests on a blend of many different data, such as pressure, muscular exertion, and appreciation of size.

There is some hope that we may in time learn to eliminate the effect of an unknown amount of previous practice by three or more distinct sets of trials. There exists a rough relation between practice and proficiency which ought to be apparent wherever progress is not due to acquiring a succession of new knacks, but proceeds regularly. When no practice has previously taken place, the progressive improvement will be very rapid; then its rate will smoothly decrease until it comes to an entire stop. I suspect that a curve might be drawn, representing the relation between proficiency and practice, and that the data afforded by at least three successive series of tests would roughly determine the position in the curve of the person who was being tested. They would show what he was capable of at the time, and approximately how much conscious or unconscious practice he had already gone through, and the maximum efficiency to which his faculty under test admitted of being educated.

An ideally perfect laboratory, whether a plain or an elaborate one, would admit of a stream of persons passing continuously through it. There would be no gaps and no blocks by the way, because the number of such instruments as might necessitate two, three, or more units of delay would be multiplied in that proportion. Again, there would be no waste of the attendant's time in idly watching examinees puzzling over tests that required a prolonged judgment, because those tests would be so contrived that the examinee might be left to himself until he had performed the specified act, after which the attendant would return and note the result. To exemplify what I mean, I will describe the test (Plate XII, fig. 2) for colour-sense by the use of wools, which is further explained on p. 215. A set of Holmgren's patterns were wound each through two holes in a separate rod, much as a net maker winds string on his netting needle, and each rod had a separate number stamped on it. A row of these rods were laid in any order side by side in a frame, with a long narrow flap above and below.

When the flaps were shut, the rods were nipped fast and their numbers were hid; when the lower flap was opened the numbers were exposed. The test consisted in telling the examinee that there were four tints of green, and he was required to point them out. Then the lower flap was opened, and the truth of his choice was tested by the correctness of the exposed numbers.

If this had been the process pure and simple, the test would have occupied an undue amount of the attendant's time, who would have had to stand by doing nothing while the examinee was hesitating. It is probable that two minutes might have been so wasted, in which case the ninety persons who daily required between them about thirteen hours of direct supervision in performing seventeen tests, would have required twice ninety minutes, or three hours, for this test alone. Such a sacrifice would have been inadmissible and it was easily avoided by a simple contrivance. Holes were bored below the bottom flap, one opposite to each rod, and four pegs were tied to the instrument. The attendant directed the examinee to put a peg into the hole opposite to each of the four greens, and then left him to ponder over his task at leisure, while he attended to others. After awhile the attendant returned, found the pegs set, and noted the result in a couple of seconds.

A similar plan was adopted in two instruments (Plate XIII, figs. 3 & 4) that I used, less for the intrinsic value of their results than as examples of the way in which a large class of tests might be methodised. They were to test the judgment of the eye in dividing a line into equal parts and in estimating squareness. The accuracy of the result was in each case measured by graduations that were hidden under a closed flap, while the examinee was left by himself to make the required adjustments. Here, again, the examiner returned after awhile, and noted the results of a prolonged pondering in a very few seconds.

On this principle very elaborate tests might be introduced into a well furnished laboratory without adding to the cost of the course by taking up the valuable time of a skilled supervisor, or of diminishing the rate at which applicants might be admitted. The stream of them would still pass regularly through, but the length of the stream included between the entrance and the exit doors would be longer.

It will be remembered that in the laboratory at the Exhibition, ninety persons passed through daily, and that the amount of skilled attendance given to them amounted in the aggregate to about thirteen hours: that is, seven minutes to each. But the time each person was occupied in the laboratory was fully twenty-one minutes, and often half-an-hour. In the first place, the persons to be tested were taken in pairs, that one explanation



and illustration might suffice for both, and since the promptest minded man of the two was usually the one who presented himself first, the less prompt man had the advantage of seeing his companion perform the test before he was called upon to do so himself. This duplex system changed the seven minutes into fourteen. Then there was the time occupied by each examinee in reading notices, writing down particulars of his age, state, occupation, and birth-place, in puzzling alone over set tasks, and in amusing himself by watching others.

I have dwelt at length on this because the necessity of labour-saving arrangements must be carefully borne in mind when devising a standard laboratory outfit, in which a large number of persons may be elaborately measured at a minimum of cost.

In the Appendix to this paper will be found a brief but sufficient description of the instruments used in the laboratory. I will now call attention only to those points which appear especially in need of criticism.

One omission in the laboratory has been noticed by many. I had decided, perhaps wrongly, after much hesitation, not to measure the head. My reason was, that the results would, under the peculiar circumstances of a mixed crowd of persons, each measured only once, be of little or no profit, and I feared it would be troublesome to perform on most women on account of their bonnets, and the bulk of their hair, and that it would lead to objections and difficulties. In the case of periodical measurements at schools, the head measurement would be of primary importance, and I should propose to take its maximum length and breadth with graduated calipers, and its maximum height above the plane that passes through the upper edges of the orbits and the orifices of the ears.<sup>1</sup>

I measured the chief dimensions of the body, the weight and the breathing capacity, but could devise no good method, other than what these implicitly afford, of ascertaining the bulk, and its distribution in muscle or fat. Stripping was of course inadmissible, and measurements of girth, whether of body or limb, taken over the clothes, are rather fallacious. The excess due to the presence of the clothes, and supposing no wrinkles, is six times their thickness, taking the circumference of the limb as equal to six times its mean radius. The wrinkles add an unknown amount to the error.

For the first time such a thing has been attempted, I measured swiftness of blow as distinguished from force of blow, the latter

<sup>1</sup> I have designed and made the necessary instruments since this memoir was read. They are now being constructed solidly for me by the Scientific Instrument Company at Cambridge, and they will be in use at Cambridge in the beginning of 1885.



of which is a compound result of swiftness, weight, and knack. The instrument was based upon a very pretty principle first applied by Exner in his little apparatus for measuring reaction-time. It was a matter of surprise to myself, who was born in the days of pugilism, to find that the art of delivering a clean hit, straight from the shoulder, as required by this instrument, is nearly lost to the rising generation. My instrument (Plate XIII, fig. 5) consisted of a rod, padded at one end, and running quite freely between guides. The person to be tested was asked to hit the pad which fronted him, and to drive the bar forwards with as much swiftness as he could. The rate of progress of the rod was marked by a pencil attached to a vibrating spring that had been bent to one side and was retained by a catch to be set free by the moving rod. Notwithstanding the simplicity of the test, a large proportion of persons bungled absurdly over it. They could not or would not strike straight at the pad, but punched its side, and often broke the rod and hurt their knuckles. I had the deal rod replaced by an oaken one, and they still broke it and hurt their knuckles all the more. I then, in despair, reversed the action, by passing the looped end of a string round a catch (fig. 5a), forming part of an apparatus that was fixed to the opposite end of the rod, and I attached a stirrup to the other end of the string which the examinee held in his hand while he struck out into space, pulling the rod after him. While the rod was in motion, and before it was pulled home, the free end of the lever that retained the catch struck against a peg B in the frame of the apparatus; the catch was thereby released and the string (or rather the steel wire, which I used at last) was disengaged, and there was nothing left to break. On this plan all went well. This instrument has given beautifully accordant results in successive trials, but I propose to supersede it by another pattern, not yet quite complete in details, but primarily consisting of a light hoop turning round a horizontal axis, the string disengaging itself as it does from a humming-top.

I employed only a few tests for the delicacy of the various senses, but many others might be added with advantage to a fully equipped laboratory if they were constructed on the labour-saving principle I have described.

The construction of an absolute and convenient test for delicacy of hearing, quite baffles me. I mean an apparatus that any instrument maker might construct from description, every specimen of which should emit a sound always of the same loudness and quality. Identity in the striking bodies may be ensured by using coins, and the arrangement of two pennies (that is two short cylinders) striking crossways is theoretically perfect as ensuring that the locus of contact shall be a point. But the

trouble is to hold the pence firmly and conveniently by rods, too slight to increase the sound either by echoes or by their own vibrations caused by the concussion. The rods should nip the pence at their nodal points so as not to hinder the vibrations. I should be very grateful for useful suggestions.

The sickle-shaped hand instrument (Plate XII, fig. 1) used for reading small test type, first with one eye and then with the other, acted excellently, but the light in the laboratory was often bad. I used pages cut out of the shilling diamond edition of the Prayer Book, because it was easily accessible, and to enable persons who had been tested at the laboratory to repeat the identical experiment at home with their friends. But printed sentences, especially when they are so generally well known as those in the Prayer Book, are objectionable: a page of logarithms would be much better.

I exhibited, but did not use, a model of a test for delicacy of touch, so far as pressure is concerned, which has merits, but would I feared have occupied too much time. It is a "Roberval" balance, like a common letter weigher; the finger is laid on one scale pan, and the object of the instrument is to increase or diminish the weight in the other pan with perfect smoothness and at any desired rate. I effected this by placing a light cylindrical glass vessel, half filled with water, in the other scale pan, and suspended a broad plunger above it on the "Roberval" principle.

When the plunger was depressed, the water rose in the graduated glass cylinder, and the effect was exactly the same as if an equivalent amount of water had been poured in; conversely, the water sank when the plunger was raised. The action of the instrument seems perfect, but it exists as yet only as a working model.

A useful set of tests of judgment of absolute weights might be added, such as by requiring vessels to be filled with sand, till in the judgment of the examinee the one should weigh a pound, and the other an ounce, and then setting them in scales and recording the percentage of error. Similarly as regards absolute length, as by pulling out slides until they measured respectively a yard, a foot and an inch, and then opening a flap and displaying the test graduations in percentages of the yard, foot, and inch.

I will not take up time by describing other contrivances more or less promising that I have thought of but not actually used, and will now conclude by submitting the points on which I have dwelt to discussion, adding that I should also feel sincerely obliged by any helpful remarks that may be sent to me in writing

## APPENDIX

(Chiefly extracted from the 1d. book sold by Authority at the Exhibition).

The object of the Anthropometric Laboratory is to show to the public the great simplicity of the instruments and method by which the chief physical characteristics may be measured and recorded. The instruments at present in action deal with Keeness of Sight; Colour-Sense; Judgment of Eye; Hearing; Highest Audible Note; Breathing Power; Strength of Pull and Squeeze; Swiftmess of Blow; Span of Arms; Height, standing and sitting; and Weight.

Such is the ease of working the instruments that a person can be measured in all these respects, and a card containing the results furnished to him, while a duplicate is made and preserved for statistical purposes, at a total cost of 3d.

The use of periodical measurements is two-fold, personal and statistical. The one shows the progress of the individual; the other that of portions of the nation, or of the nation as a whole.

### *Description of the Laboratory.*

A space 36 feet long by 6 feet wide is fenced off from the side of a gallery by open lattice work. It is entered by a door at one end, and is quitted by a second door at the other. The public can easily see through the lattice work, while they are prevented from crowding too close. A narrow table runs half-way down the side of the laboratory, on which the smaller instruments are placed. The measurements with the larger ones take place in the open space beyond the table.

The successive stations for the various operations lie in the following order:—

1. Desk at which the newly-entered person writes down certain data concerning himself.
2. Standard specimens for colour of eyes and hair.
3. Sight: (a) its keenness; (b) the colour-sense; (c) judgment of the eye in estimating length and squareness.
4. Hearing: (a) its keenness (scarcely practicable on account of the noise and echoes); (b) highest audible note.
5. Touch (exhibition of various apparatus).
6. Breathing capacity.
7. Swiftmess of blow with fist.
8. Strength: (a) of pull; (b) of squeeze with right and with left hands.
9. Height: (a) when sitting, measured from the seat of the chair; (b) standing in shoes; (c) the thickness of the heel of the shoe.
10. Span of the arms.
11. Weight.

*Process gone through.*

1. THE DESK.—On payment of 3d. at the door, the applicant is admitted to the desk, and given a frame which contains a card, over which thin transfer paper is stretched. Carbonised paper is placed between them. Thus a duplicate copy of the entries is obtained, to be kept for statistical purposes. The card with the entries upon it is given to the person measured.

No names are asked for. The following plan is adopted to secure such data for the duplicate copy as are needful for its use as a statistical document, without annoying the applicant, who may be disinclined to parade his or her age, &c., on the card. The transfer paper is doubled over the back of the card, and no carbonized paper is put behind the flap; consequently what may be written upon it will not appear on the card. The particulars required on the flap are: Age last birthday; birthplace; state (married, unmarried, or widowed); residence, whether urban, suburban or country; occupation. All this takes place at the first station, which is partially curtained for the sake of privacy.

When these data have been written, the frame is turned over, and the other side is henceforth uppermost. On this the attendant marks the sex, and the applicant writes his initials or other distinguishing mark, to guard against any accidental interchange of the frames belonging to different persons who are simultaneously undergoing measurement.

At this same station is suspended a card, with specimens of wool of various shades of green worked upon it. Attention is directed to these specimens, that the applicant may clearly understand what will be required of him a few stations on, when his colour-sense is tested by his being asked to pick out all the green shades from among many wools of different colour. It is important that he should appreciate the wide variety of shades that are used, otherwise he may fail in the test, owing to a misunderstanding of what he is wanted to do.

2. COLOUR OF EYES AND HAIR.—Artificial eyes of standard colours are exhibited, together with the following descriptive names—dark-blue, blue, grey, dark-grey, brown-grey, (green, light hazel), brown, dark-brown, black. The attendant will note the colour of the eyes, but no entry will be made regarding the colour of the hair, for the reason that what with the darkening effects of pomades, and of dyes, and the misleading appearances of false hair, no useful results could be arrived at. However, for the convenience of the visitor, samples of standard colour of hair are exhibited, and the names are attached by which the chief varieties of colour are usually described. They are flaxen, light-brown, brown, dark-brown, fair red (golden), red, dark red (chestnut auburn), black.

3. SIGHT.—(a) *Keeness of Eye-sight* is measured by the greatest distance at which the small print known as "diamond" type can be read.

The eyes are tested separately, as it often occurs that they differ

considerably in efficiency without the person being aware of the fact, who ought in that case to use appropriate glasses.

The apparatus (Plate XII, fig. 1) is a long and light frame with a single eye-hole. Blocks of wood about  $1\frac{1}{4}$  inch wide and  $2\frac{1}{2}$  inches high, each with a sentence in diamond print pasted upon its face, are fastened square to the line of sight at distances of 7, 9, 11, and so on up to 41 inches. The number of inches is painted in bold figures on the upper part of the face of each block. The blocks are disposed in a curve, so that when viewed from the eye-hole each stands just clear of the preceding one (see fig. 1a); the curve of the frame is, in fact, an equiangular spiral. First the right eye is tested, and then the left eye, and the greatest distance at which the type can be read by each of them is recorded. If the print cannot be read at all by the unaided eye, a cross is marked on the schedule.

*b. Colour-Sense.*—A series of bars are packed closely side by side in a frame, looking something like the keys of a pianoforte. Fig. 2, Plate XII, shows only a portion of the instrument, as the right hand part has been broken off in order to exhibit its construction more distinctly. The two flaps are half opened for the same reason. When the upper flap is closed, the part B keeps the bars in an even row, and the part C nips their tops. When the lower flap is closed, the numbers on the bars are hidden. Along the middle part of each of these bars a differently coloured wool is wound lengthways, and the foot of each bar is stamped with a separate number. In the frame there are as many peg-holes as there are bars, one hole to each bar. The order of the bars can be changed when the instrument is unlocked. The frame is placed before the person to be tested, the numbers are hidden by the flap A, and he is required to insert a peg opposite each of the bars that has any shade of green wound round it. After he has leisurely done this to his satisfaction the attendant lifts up the flap and displays the numbers of the chosen colours, and records the fact of his having judged rightly or wrongly as the case may be.

*c. Judgment of Eye as regards Length.*—A board (Plate XIII, fig. 3) has two pairs of parallel strips of wood fastened across it, between each of which a bar slides freely. In each case a square rod, 15 inches long and somewhat longer than the bar, is hinged to it along its edges, and when closed down upon it, hides it altogether. There is a movable pointer attached to the lower of each pair of strips. The position of the pointers is shown in the figure, but the scale of the drawing is too small to show the slot and the rest of the easily-to-be-imagined arrangement by which they are rendered movable. In the one pair, the pointer is set somewhere about midway, and the person to be tested is desired to slide the rod until its middle is brought as nearly as he can judge opposite the pointer. When he has done this, the hinged rod is lifted and the face of the bar is exposed. This has a central fiducial mark, and bears graduations on either side of it each equal to  $\frac{1}{100}$  of the total length of the rod. The error of adjustment is thus determined in percentage.



The second rod has to be set so that the pointer shall correspond to one-third of its length, and the error of adjustment is similarly read off in units, each equal to a hundredth part of the total length of the rod.

*As regards Squareness.*—A board (Plate XIII, fig. 4), including a sector of a circle, has an arm movable about the centre of the circle, while a broad flap of which the last part is supposed in the figure to have been broken off, hides its free ends. A black line AB is drawn across the board. The person tested is desired to set the arm as squarely as he can to the black line. When he has done this, the attendant lifts the flap and exposes a scale of degrees graduated on the foot of the board, and reads off the error of the setting of the arm in degrees.

*HEARING.*—(a) *Its Keeness.*—Some apparatus is exhibited by which at least the relative acuteness of hearing can be tested; but it will not be used, as the noises and echoes of the building render such determinations untrustworthy.

(b) *Highest audible Note.*—An india-rubber tube communicates through 5 others with 5 fixed whistles of small bore, and of depths that will give 50, 40, 30, 20, and 10 thousand air vibrations in a second respectively—that is, of the several depths of 0·067, 0·084, 0·113, 0·169, and 0·380 inch. Each tube is nipped by a separate clamp. These are numbered in order, 5, 4, 3, 2, 1, and serve as keys. When any one of them is depressed, air is blown through the corresponding whistle, and is thrown into vibrations which can be heard by some as a shrill and pure note, while others hear merely a puff or nothing at all. Every person has his limits of power of hearing high notes, quite independently of the general acuteness of his hearing. The test lies in ascertaining which is the shrillest of the five notes that is audible. The precise limit of audible sound may be found by using a whistle that has a movable plug for its base. The larger of the small whistles are made by Messrs. Tisley & Co., 172, Brompton Road; the smaller and more delicate ones are made by Mr. Hawkesley, 357, Oxford Street.

*TOUCH, &c.*—Several instruments are exhibited, but it is not proposed to test with them, as the requisite time cannot be spared.

*BREATHING CAPACITY.*—A spirometer is used, made by a counterpoised vessel suspended in water. When the air is breathed into it through a tube, the vessel rises, and the scale at its side shows the number of cubic inches of displacement. The person to be tested fills his chest and expires deeply three or four times for practice, then, after a few seconds' rest, he tries the spirometer. Spirometers are usually furnished with a stop-cock to the breathing tube, which is intended to be closed when the expiration has ceased. An inverted glass syphon with a little water in it is connected with the breathing tube beyond the stop-cock. If the water does not stand at the same level in the two arms of the syphon it would show that the air in the spirometer was somewhat compressed or dilated as the case might be, and the air cylinder would have to be slightly adjusted before reading off. However, the error caused by neglect-



ing this manometer rarely exceeds 4 cubic inches, and may be disregarded.

**SWIFTNESS OF BLOW.**—A flat bar (Plate XIII, fig. 5) with a pad, P, at one end runs freely between guides. The blow is delivered with the fist straight at the pad, driving the rod nearly or quite home, or else the blow is converted into a pull by holding a stirrup attached to a string, and striking out into space. The stirrup is attached to a string or, better, to a piece of steel pianoforte wire which is looped round a catch that forms part of a little apparatus attached to the bar, and which is shown enlarged in fig. 5a. When the bar is in full motion the catch releases the string or wire, so that there is nothing to break. The swiftness of the motion of the bar is registered as follows:—Across its path a bridge is fixed and a flat steel rod projects from the bridge, lying above the bar and parallel to it. Its free end points in the same direction as that towards which the bar is driven by the fist. When the bar is set back ready for use, an arm, A, turning round a pin fixed in the framework is set so as to push the spring forcibly to one side, but as soon as the bar begins to move, a stud that is fixed to the bar strikes the arm from before it, and so releases the spring, which thereupon vibrates transversely to the moving bar. A pencil is attached to the spring, and the upper face of the bar carries a strip of the prepared cardboard used for white flexible slates. The pencil leaves a sinuous trace on the strip as shown in the lower figure, and the points where the trace crosses its own median line can be measured with precision. The spring that is used makes twenty-five complete vibrations in a second. Hence, if the interval between any two alternate crossing-points is 0.48 inch in length, the bar is travelling 1 foot per second. A scale is constructed of which the unit is 0.48 of an inch, and the graduations upon it are in feet per second. By applying this scale to the curve, the swiftness of the corresponding blow is immediately read off.

**STRENGTH (a) of pull.**—The well-known instrument with a spring, dial, and pointer, made by Salter, is held as an archer holds his bow when in the act of drawing it, and the strength of the pull is given by the index.

(b) *Of squeeze.*—The instrument, also made by Salter, is tried first in the right hand, secondly, in the left hand.

**SPAN OF ARMS.**—A pair of rods, sliding over each other and with projections at either end, is held so that the tips of the fingers press against those projections; then the arms are extended to their full stretch. The graduations show the span.

**HEIGHT (a) above seat of chair.**—A quickly acting measuring-rod is fastened upright to the back of a solid and narrow chair.

(b) *Standing in shoes.*—This is taken by a measuring-rod fixed against the wall.

(c) The thickness of the heel of the shoe is measured.

Lastly *c* is subtracted from *b*, which gives—

(d) The height without shoes.

**WEIGHT.**—A simple commercial balance is used, as cheaper, more

accurate, and much more capable of bearing hard usage than the lever balances. Its sole disadvantage lies in the necessity of handling heavy weights during its use. Overcoats should be taken off, the weight required being that of ordinary indoor clothing.

Most of the instruments in use at the laboratory are wholly or in large part of my own designing. Those that are not are the spirometer, the instruments for testing strength of pull and of squeeze, and the weighing machine.

On the opposite page is a *fac simile* of the Schedule which was retained at the Anthropometric Laboratory. The card that was presented to each person examined was a duplicate of all the entries in the Schedule, except those printed crosswise at the right hand side.

#### *Explanation of Plates XII and XIII.*

(For description, see both the *Memoir* and the *Appendix* to it.)

Fig. 1. Instrument for testing keenness of sight.

- „ 1a. Diagram showing how each of the blocks appears to stand just free of the preceding one when they are viewed through the eye-hole.
- „ 2. Part of the apparatus for testing colour-sense by various samples of coloured wools. The right hand portion is supposed to be broken off.
- „ 3. Apparatus for testing the accuracy of the judgment of the eye, in dividing a rod into two, and into three equal parts.
- „ 4. Apparatus for testing the judgment of the eye as regards squareness. The left hand portion of a flap that conceals graduations is supposed to be broken off.
- „ 5. Apparatus for testing swiftness of blow or pull.
- „ 5a. Shows the mechanism of a self-acting catch, which releases the string by which the rod is pulled just before the rod comes home.

INTERNATIONAL HEALTH EXHIBITION, 1884.

ANTHROPOMETRIC LABORATORY,  
Arranged by Francis Galton, F.R.S.

at the late International Health Exhibition.

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|  |                |  |          |
|--|----------------|--|----------|
| Sex  | Colour of eyes | Date   | Initials |
| <p>EYESIGHT.</p> <p>Greatest distance in inches, of reading "Diamond" type } right eye   left eye</p>        |                | <p>SWIFTNESS</p> <p>of blow of hand in feet per second }</p>                                     |          |
| <p>Colour-sense, goodness of }</p>   |                | <p>STRENGTH</p> <p>of squeeze in lbs. of } right hand } of pull in lbs. }</p> <p>of left " }</p> |          |
| <p>JUDGMENT OF EYE.</p> <p>Error per cent. in } in three parts }</p> <p>dividing a line of } 15 inches }</p> |                | <p>SPAN OF ARMS</p> <p>From finger tips of } opposite hands }</p> <p>feet, inches.</p>           |          |
| <p>Error in degrees of estimating squareness }</p>   |                | <p>HEIGHT</p> <p>Sitting, measured from seat of chair }</p> <p>feet, inches.</p>                 |          |
| <p>HEARING.</p> <p>Keeness can hardly be tested here owing to the noises and echoes.</p>                     |                | <p>feet, inches.</p>   |          |
| <p>Highest note audible } between } vibrations per second. }</p> <p>0'000 and 0'000</p>                      |                | <p>feet, inches.</p>   |          |
| <p>BREATHING POWER.</p> <p>Greatest expiration in cubic inches }</p>   |                | <p>feet, inches.</p>   |          |
|  |                | <p>WEIGHT</p> <p>in ordinary in-door clothing in lbs. }</p>                                      |          |

Age last birthday? \_\_\_\_\_

Married or unmarried? \_\_\_\_\_

Birthplace? \_\_\_\_\_

Occupation? \_\_\_\_\_

Residence in town, suburb, or country? \_\_\_\_\_

## DISCUSSION.

Mr. C. ROBERTS remarked that Mr. Galton had invited the meeting to examine, criticise, and suggest such alterations as they might think desirable in the anthropometric apparatus he had set before them; but his ingenuity in the preparation of instruments of this kind was so well known that there was little room for criticism. He had, however, confessed that he had not yet been able to devise a satisfactory instrument for testing the sense of hearing, and Mr. Roberts would therefore venture to direct his attention to a little instrument sometimes used for testing the hearing of idiots, which could, he thought, in Mr. Galton's hands, be made a useful and trustworthy test. It consisted of a series of slips of very different materials, such as wood, slate, metal, &c., suspended from a bar, and used like a set of gongs. For taking the diameters of the head in a ready way, which was also a subject on which Mr. Galton asked for suggestions, the speaker had always employed a pair of wooden callipers of his own design, which answered very well; but he wished Mr. Galton would direct his attention to devising a simple form of the instrument employed by hatters for gauging the heads of their customers. With regard to some of the apparatus before the meeting, he feared that the results obtained by the very ingenious contrivances for testing the sense of weight, the sense of touch, and the capacity for determining the perpendicularity, or the division of an object, were tests of education of certain faculties, and he should expect to find a post office clerk or grocer to have a finer appreciation of weight than any one less accustomed to the handling of weights. The test for colour-blindness was hardly sufficient. It was Holmgren's light green test, which proved no more than that there was some defect of the colour-sense, but which might not amount to actual colour-blindness. The purple test could easily be arranged in the same apparatus. Purple holds the unique position of appearing blue to the red-blind, grey to the green-blind, and red to the violet-blind, and is employed as a test for all these kinds of colour-blindness. Mr. Galton had asked the speaker to explain the models for determining the colour of their eyes. The classification was made on simple anatomical grounds, and two great classes were formed dependent on the presence or absence of a layer of pigment in *front* of the iris. When this layer of pigment is present we have the whole series of *dark* eyes, varying from light brown to what is commonly called black; and when it is absent we have the series of blue and grey eyes, which result from the black pigment on the *inner* surface of the iris, showing through, with greater or less distinctness, the semi-transparent structures of the iris itself. In conclusion, Mr. Roberts observed that he should look forward to the results of the observations made in the Anthropometric Laboratory at South Kensington with great interest; and expressed his great satisfaction at the prospect which Mr. Galton

held out, that the Laboratory was likely to be established in a permanent form.

Mr. R. MELDOLA asked, with reference to the instruments for measuring the focal lengths of the eyes, whether Mr. Galton had not found it necessary to take two readings for each person, one for the right eye and the other for the left eye. He asked this question because a large number of people differed in the focal lengths of their two eyes, often to the extent of several inches, he himself being a case in point.

Miss HENRIETTA MUELLER, Mr. R. B. MARTIN, Mr. G. GRIFFITH, M. BERTIN, Mr. E. W. STREETER, Dr. GARSON, Mr. G. M. ATKINSON, Mr. BLOXAM, Prof. THANE, Dr. W. H. COFFIN, and the PRESIDENT also joined in the discussion.

Mr. GALTON, in reply, said that the method suggested by Mr. Meldola had always been adopted, and that the statistics led to the interesting result that there was no preponderating number showing that one eye had a general tendency to be longer-sighted than the other. In fact, the statistical records for the two eyes were exactly equal.

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NOVEMBER 25TH, 1884.

Professor W. H. FLOWER, LL.D., F.R.S., *President, in the Chair.*

The minutes of the last meeting were read and signed.

The following presents were announced, and thanks voted to the respective donors:—

FOR THE LIBRARY.

From ADMIRAL F. S. TREMLETT.—*Les Alignements de Kermario.*  
By James Miln.

From the DEUTSCHE GESELLSCHAFT FÜR ANTHROPOLOGIE.—*Correspondenz Blatt.* September, 1884.

From the BERLINER GESELLSCHAFT FÜR ANTHROPOLOGIE.—*Zeitschrift für Ethnologie.* 1884. Heft. 4.

From the SOCIETÀ ITALIANA DI ANTHROPOLOGIA.—*Archivio per l'Antropologia e la Etnologia.* Vol. XIV, Fas. 2.

From the AUTHOR.—*Über die Zahl der Zähne bei den Hasenschartenkiefer-spalten.* By Prof. Dr. Paul Albrecht.

— *Ueber die Morphologische Bedeutung der Kiefer-, Lippen-, und Gesichts-spalten.* By Prof. Dr. Paul Albrecht.

— *Der Zwischenkieferknochen und seine Beziehungen zur Hasenscharte und zur schrägen Gesichtsspalte.* By Prof. Dr. Paul Albrecht.

- From the AUTHOR.—*Sur les Éléments Morphologiques Manubrium du sternum chez les Mammifères.* By Prof. Dr. Paul Albrecht.  
 — *Sur les Homodynamies qui existent entre la main et le pied des Mammifères.* By Prof. Dr. Paul Albrecht.  
 — *Ein neuer Fundort von Nephrit in Asien.* By Dr. A. B. Meyer.  
 From the EDITOR.—*Matériaux pour l'Histoire de l'Homme.* November, 1884.  
 — *The Illustrated Science Monthly.* November, 1884.  
 — "Nature." Nos. 785, 786.  
 — "Science." Nos. 91, 92.  
 — *Revue Scientifique.* Tom. XXXIV, Nos. 19-21.  
 — *Revue Politique.* Tom. XXXIV, Nos. 19-21.

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The election of the following new members was announced:—

WALTER HURST, Esq., and THOMAS WILSON, Esq.

Dr. J. G. GARSON exhibited a prehistoric skull and some long bones from the Island of Antiparos.

Mr. WALTER COFFIN exhibited a cast of the mouth of a hairy boy from Russia, showing abnormal dentition.

The following paper was read by the author:—

FACTS *suggestive of* PREHISTORIC INTERCOURSE *between* EAST *and* WEST. By ANNE WALBANK BUCKLAND.

THE meeting of the British Association on American soil, and the increased importance accorded to the science of Anthropology at that meeting, suggested to me the desirability of endeavouring to gather together such broken threads as might help us to a knowledge respecting that early prehistoric intercourse, which most anthropologists believe *must* have taken place between the two hemispheres, although the date and the route of such intercommunication remain unknown.

Dr. Wilson, in treating of this subject, points out three probable routes of migration from the eastern to the western hemisphere: 1, through the Isles of the Pacific to South America; 2, an Atlantic Oceanic migration, *via* the Canaries, Madeira, and Azores, to the Antilles and Central America, and probably by the Cape Verdes to Brazil; and 3, *via* Behrings Strait and the North Pacific Islands to the Mexican Plateau. But he adds: "The more obvious traces rather indicate the same current which set from Southern Asia to the Pacific



shores of South America, moving onward till it overflowed by Behrings Strait and the Aleutian Isles, into the continent from whence it was originally derived."<sup>1</sup>

It is obvious that as all these migrations necessitate a sea voyage of considerable length, they could only have been undertaken by peoples having some knowledge of the art of navigation; it is therefore desirable, in the first place, to ascertain how far the native vessels of the American continent support the theory of Professor Wilson.

Taking the very interesting and instructive paper of General Pitt Rivers on "Early Modes of Navigation"<sup>2</sup> as our guide, we find on the American continent, first, the dug-out canoe, the earliest and simplest of all boats, the distribution of which is almost universal, and which probably played an important part in the very earliest migrations of the human race, enabling them to cross rivers and narrow seas; but we find that the Waraus of Guiana, and the Ahts of North America, fashion their canoes after the Birmanese model, whilst the Fuegians, otherwise so low in the scale of civilisation, sew planks together with thongs of raw hide, after the fashion of those in use in Africa and the Polynesian Islands. In California we see the papyrus float of Egypt; but the outrigger, so much used in the Pacific, does not appear to have found its way to America, although the *Buccina*, or shell trumpet, used on board the canoes of the Pacific, and known also in ancient Rome, is used in Peru. Rafts, like the Madras catamaran, were in use in Peru at the time of the conquest, and carried sails; one of these vessels having been met far out at sea, conveying both men and women, with provisions and articles of commerce, to the great astonishment of the Spaniards, who had never before seen sails used on the American continent. From this slight sketch it will be seen that the art of navigation had made some advance on the American continent before the Spanish conquest, and that the forms of the vessels used can be traced to various parts of the world, although the absence of the outrigger, and the general absence of sails, would seem to show that whatever connection there might have been with Asia and the Polynesian Islands must have ceased before the invention of those two important improvements in primitive navigation.

Turning from navigation to the implements and utensils in use among the American nations before the conquest, we are again met by the fact that their congeners may be traced to many parts of the world. It would be impossible to point out

<sup>1</sup> "Prehistoric Man," D. Wilson, p. 384.

<sup>2</sup> See "Early Modes of Navigation," Colonel Lane Fox ("Journ. Anthropol. Inst.," April, 1875).

all these, but I may note one or two weapons which, from their peculiar shape, have struck me as particularly useful by way of comparison. And first, an axe-head, probably of metal, which seems to have been regarded as sacred. This axe, called *champi*, with a handle more than a cubit in length, was given to princes on the occasion of their initiation into manhood, as a mark of honour. It is described in the Royal Commentaries thus: "The metal part had a blade on one side, and a sharp point on the other." This probably represents the *wedge* of gold said to have been carried by Manco Capac, and which sunk into the earth at Cuzco.

In the remarkable rock-sculptures in the Yonan Pass, Peru, copied in Hutchinson's "Two Years in Peru," we find a rudely designed figure bearing this axe with a long handle, and having the head adorned with an axe-blade of a similar shape: this was probably an emblem of authority, for we find this same axe-blade attached to the helmet of the curious and unique figure portrayed on a vase found near Trujillo, Peru, which Bollaert looks upon as representing the god of war, and which certainly has a strong affinity with Hanuman, the monkey-god of India. Bollaert also points out the similarity between the vase bearing this figure and those of Etruria, and further remarks that the flying insect resembles a figure on the Athenian vase of Electra at the tomb of Agamemnon.<sup>1</sup> To this I would add that there is a remarkable resemblance between the ornaments round the girdle of this figure, and those singular Chinese or Japanese ornaments, called *magatamas*.

This axe-head appears again as an ornament on the head of the Mexican god of hell (*Miclantecutli*), and it is also worthy of remark that the same squareness of face, and the pointed ornaments surrounding the faces, which apparently represent the sun-god in the Yonan Pass sculptures, and which appear so prominently in the figure on the great central gateway of Tiahuanaco, are seen in this Mexican figure.<sup>2</sup> I have not been able to trace this axe-head ornament in Egyptian, Greek, or Etruscan sculptures, although it appears to me that the ornament on the Greek helmets which holds the plume, may have been derived from it; in fact, on some of the vases the form seems well defined. Two bronzes in the British Museum, labelled "Parts of Assyrian Helmets," are of precisely the Peruvian form, and it appears also on two horses among the Assyrian sculptures.<sup>3</sup> It is seen, however, on some of the monuments from Halicarnassus now in the British Museum, and on the Hercules from the same place,

<sup>1</sup> "Antiquities, &c., of South America," Wm. Bollaert, F.R.G.S., p. 203.

<sup>2</sup> See Smithsonian Contributions, 1879-80.

The horses bearing this ornament are said to be foreign.

and is figured by Wilkinson as forming an ornament on the Persian horses, whilst the axe from which this ornament seems to have been derived appears in India in the Hamath hieroglyphics, and there seems to be an approximation to the form in Egypt. The Esquimaux have also a copper implement of the same form, and it is represented in New Guinea in a betel-spoon of carved wood.

Another axe, figured frequently in the Mexican paintings, bears a strong affinity to those still in use on the West Coast of Africa.

A still more curious weapon called the *mahquahuittl*, very frequent in the Mexican paintings, and which consists of several blades of obsidian inserted in a wooden handle, appears to be represented among the sculptures of Southern Peru; it somewhat resembles the Egyptian hieroglyph known as the emblem of stability, and its nearest affinities seem to be a wooden club in use in New Guinea, and the shark's-tooth sword or spear of the Philippines.

The strong resemblance between the pottery of Peru and that discovered by Dr. Schliemann at Hissarlik, cannot fail to strike every one, and has been very frequently remarked upon by antiquaries; but it is singular to find the figure which occurs so frequently on the Hissarlik vases appearing *reversed*, on vessels apparently sacred, in the Mexican paintings; whilst the Mexican form of the same symbol is found among the rock-sculptures of Scotland, in conjunction with the T seen frequently in the hieroglyphs of Palenque. Nor is this the sole example of similarity between the symbolic sculpturings of America and Scotland. To say nothing of crosses and circles with and without centres, which are plentiful in almost every part of the world in which rock-sculptures are found, we may point out that the figure designated a *boar*, which is seen on the Scotch monuments, resembles much more nearly the American tapir, than a similar figure usually called an *elephant* resembles that animal. In both cases the design would appear to be drawn from memory or description, and is therefore far inferior to the horse and the bull on the same monuments. There is a figure occurring frequently among the Scottish and British sculptured stones which has been designated the *incomplete circle*; it consists of a series of concentric rings with a dot in the centre, from which proceeds a line leading through and beyond the circles in various directions. This form is figured in Mr. Markham's translation of the Royal Commentaries, where it is thus described: "The army reached the town of Tumpampa, where the Inca ordered water to be brought from a river by boring through a mountain, and making the channel enter the city by curves in

this way." Cup-markings, so common in Europe, are also to be found in Peru; but two still more remarkable similitudes must not be omitted before quitting this part of our subject.

Among the most hideous of American sculptures are the gigantic figures of Pensacola, represented with protruding tongue, and this symbol of the protruding tongue, generally accompanied by immense fangs, seems to range in ancient American sculptures from Mexico and Central America to Peru. Dr. Wilson gives a modern example of this symbol, the work of the Tawatin Indians, and it may be seen in a curious figure from a Peruvian vase. In Mexico this protruding tongue was a symbol of Quetzalcoatl. The same symbol appears on some of the early coins of Europe,<sup>1</sup> and is one of the characteristics of the god Bes in Egypt, and of the Gorgon of Etruria. Another still more curious resemblance between the sculpturings of the East and West is found in the winged globe so well known in Egyptian, Assyrian, and Persian sculptures. The American example of this mythological emblem is drawn in Stephens's "Central America and Yucatan," having been found by him among the ruins of Ocosingo. These ruins are pyramidal structures, over the door of one of which appears this ornament in stucco. Stephens describes it thus: "The wings are reversed, there is a fragment of a circular ornament, which may have been intended for a globe, but there are no remains of serpents entwining it." On comparing the figure of this ornament from Stephens's book with the Egyptian form, I believe no one will doubt that, notwithstanding the reversed position, the two are substantially the same. Nor do I think this is the only example of this very suggestive form, for in the elaborate paper by Mr. Holden in the "Smithsonian Contributions," on "Studies in Central American Picture-writing," a view is given of the exterior of the Adoratorio at Palenque, and there, over the door, is a fragment of a stucco ornament strongly suggestive of a similar device. The reversal of the figure is worthy of remark, because it seems to be common not only in America, for Mr. Park Harrison has observed the same in the Phœnician alphabet discovered in Sumatra.

I have already pointed out this peculiarity with regard to the ornament on the Mexican vases as compared with those of Hissarlik, and believe the same may be applied to some of the hieroglyphic figures on the rocks of the Yonan Pass, Peru, already noticed; these hieroglyphs strongly resemble letters, but, according to the Phœnician alphabet, appear to be upside down. This, however, does not apply to one figure, which appears to be an ordinary Chinese letter. The most probable

<sup>1</sup> As, for example, at Populonia and Parium in Mysia.

reason for the observed reversal of letters and figures appears to me to be that they have been engraved either from memory or by workmen ignorant of their signification, who, receiving their pattern, applied it according to their own ideas, or by transfer.

Many more examples of the identity of the symbols employed in America and the eastern hemisphere might be adduced, as, for example, a curious form which might have been the origin of the *arms* of the Isle of Man, and which appears prominently in the rock carvings of both hemispheres. Then there is the cross, both in its simple form and the more elaborated Maltese and *Swastika* patterns; the **T** also appears very frequently; but these have already been learnedly discussed by various ethnologists and antiquaries, and my object in this paper is rather to bring forward less known forms and facts, for which reason I also omit all reference to the serpent, in its apparently identical significance in the Old World and the New, which subject I have already treated at some length in a paper on "The First Metallurgists," contributed to the *Westminster Review* for January, 1875. But there is one figure which occurs very frequently among the Mexican paintings, of a bird with a female head, which so strongly resembles the harpy or siren of Greece and Rome that it must not be passed over in silence. Again, the *extended hand*, so prominent in the sculptures of Central America, and so common both in the rude rock-sculpturings and paintings of savages all over the world, and which appears in several forms identical with those of Mexico and Central America, in the Hamath hieroglyphics (which hieroglyphs seem to me to bear the strongest resemblance of any to those of Mexico and Palenque), has a symbolism, perhaps not wholly understood as yet, but which the researches of Mr. Garrick Mallery into the "Sign Language of the North American Indians" bid fair to unravel.

If we turn from forms and symbols to the great prehistoric monuments of the two hemispheres, we shall find a still more striking resemblance.

The likeness between the Pyramids of Mexico and those of Egypt and Assyria has frequently been pointed out, as also that between the great Serpent Mound of Ohio and our own Avebury; but that which is less generally recognised is the existence of stone circles and dolmens in Peru, with legends attached to the former entirely corresponding with those in Cornwall, where, as is well known, these stone circles are known as *dance maidens*, the legend being that they were heathen dancers turned into stone for disobedience to a Christian missionary, but which believers in the solar myth look upon as a corruption from *Dawns maen*, significant of solar worship. The



similar legend attaching to the Peruvian circles I give in the words of Salcamayhua, as translated by Mr. Markham. After giving a legend resembling that of St. Thomas, in which Tonapa crosses the lake on his outstretched mantle, he adds: "They say that the people of that town (Tiyahuanacu) were engaged in drinking and dancing when Tonapa came to preach to them, and they did not listen to him. Then, out of pure anger, he denounced them in the language of the land; and when he departed from that place all the people who were dancing were turned into stones, and they may be seen to this day."

I know of only one dolmen, described by Hutchinson,<sup>1</sup> but others doubtless exist, and it is not a little singular to find Quetzalcoatl in Mexico credited with the erection of a rocking stone, like those attributed to the Druids in Cornwall. Bancroft says (vol. iii, page 254), "Some say that Quetzalcoatl built certain subterranean houses called *mitlancaleo*; and further, that he set up and balanced a great stone, so that one could move it with one's little finger, yet a multitude could not displace it." In like manner the second of the Peruvian Incas is credited with having made his soldiers erect cairns or stone heaps called *usuns*, "every passer-by must bring a stone and throw it and their *coca* pellets on the heap as they passed."<sup>2</sup> Of the Cyclopean architecture of the Peruvians and builders of the gigantic ruins of Central America I have not space to speak, but must point out their strong analogy with the remains of Egypt, the tombs of Mycenæ and Etruria, and also with some of the gigantic mounds of Ireland, especially with regard to the form of the doorways, and the method of forming the roof of overlapping stones. All these things, however, have been pointed out by many writers, the general conclusion arrived at being that these ruins are extremely ancient, and of indigenous origin in their several centres, notwithstanding the casual resemblance to Egyptian, European, and Asiatic art, apparent in most of them.<sup>3</sup>

But of all the monuments of prehistoric America, the great earth mounds of Ohio and the Mississippi are perhaps the most remarkable; gigantic earthworks representing various animal

<sup>1</sup> "Two Years in Peru."

<sup>2</sup> Markham: "Rites and Laws of the Incas," p. 76.

<sup>3</sup> Since writing this paper I have received "*The Californian Architect and Building News*," containing an account of the Mexican Pyramids, in which the author puts forward an idea which, if it should be verified, would go far not only to connect these pyramids with those of Egypt, but also to give an approximate date for their construction. He says: "There is, however, this remarkable circumstance in the situation of the pyramids, that the line joining the centres of both, follows within two degrees a true north and south line. The little discrepancy may be accounted for by the supposition that they were aligned by some star near the Pole at the time of their construction, probably Alpha Draconis, but not Polaris, as, erroneously, Almaraz says."



forms, circles, squares, and oblongs, designed apparently to serve some great mythological purpose, and to perpetuate some religious mystery. They have been divided into sepulchral mounds, sacrificial mounds, and mounds of observation; but in any case they seem to have been constructed by a race of sun-worshippers, and to bear a decided analogy with the erections of the early sun and serpent worshippers of the Old World. That the mound builders came originally from a more southern latitude seems proved by the sculptures of animals not found in North America, and I would call especial attention to three mounds figured in the "*Journal of the Anthropological Institute*," as seeming to bear particularly upon the religious systems both of Peru and Asia. In these three mounds we find an oblong figure between a greater and a lesser circle, representing, as I believe, the mundane egg between the sun and the moon, as hung in Peruvian temples, and in those of Egypt and Assyria. In Peru the mundane egg appears to have been signified by the plate of fine gold described by Salcamayhua as signifying "that there was a Creator of heaven and earth."

It is, however, when we come to burial customs that we are struck by the great variety in use on the American continent, and their identity with those in other parts of the world, extending even to those small details which would not seem likely to have arisen spontaneously in the minds of people wholly separated. The use of masks, which prevailed so largely on the American continent, as well as in Egypt, Greece, and Etruria, may be noticed as one of these peculiarities; another is the cording of the body, so as to keep it in that doubled-up position so universally adopted in very ancient times, and which is not only seen in Peruvian mummies, but is figured in Mexican paintings, and is still practised in Australia and in the Aleutian Islands, as well as among some tribes of North American Indians. Then there is tree-burial, also used in Australia, North Asia, and North America. But all these different modes of burial, and their several affinities, have been so elaborately and learnedly treated by Dr. H. C. Yarrow, in the volumes of the Smithsonian Institution, that I must refer my hearers to those most instructive papers for details, and only notice two or three peculiarities which have especially struck me. And first I would call attention to a remark of Consul Hutchinson, in his "*Two Years in Peru*," in which he notices the occurrence of a square opening at the base of some of the tombs. He says: "Amongst the ruins (of Parará) is one burial-place, 24 feet long and 18 feet wide, divided into three compartments cross-wise, with walls of 18 inches thick intervening. At the corner of each of these dividing walls, down at the base, there is a small aperture of about

8 inches square, the object of which it is impossible to guess at, unless it were intended to allow the spirits of the dead to hold communion with one another."<sup>1</sup> This opening, usually of a round form, is found not only in India, but very frequently in dolmens in Great Britain, France, and I think in other parts of Europe; whilst the square form is found in Cyprus and Sardinia. It is connected, as I believe, with another singular custom also found to prevail in Peru, that is *trepanning*, several instances of which are recorded as having been found in graves in Peru, but the following extract would seem to extend the practice to the mounds of Illinois:—"One of the skulls presented a circular opening about the size of a silver dime. This perforation had been made during life, for the edges had commenced to cicatrize."<sup>2</sup> There would also appear to be recorded one case of that incomplete trepanning noticed by Broca, in a skull found in Winnebago county, Wisconsin, which is thus described: "On its summit, an inch from the coronal suture, and  $\frac{1}{2}$  inch to the left of the sagittal suture, is a remarkable circular depression, an inch in diameter. It shows no signs of fracture or violence, and the inside of the skull shows no corresponding elevation. What could have occasioned this thinning of the bone we cannot tell; we only know that it must have been done long before the death of its owner, for the wound, or whatever it is, is perfectly healed, and the bone in the depression is as smooth and of the same sort as the remainder of the skull."<sup>2</sup> This appears to me to correspond with that which was shown to me by the late Dr. Broca as an example of incomplete trepanning, which he looked upon in the light of a survival from the older form, in which the perforation was complete; the reason for the perforation in the skull, and the holes in the graves being the same, that is to allow free exit to the spirit. This I have endeavoured to make clear in a paper entitled, "Surgery and Superstition in Neolithic Times," published in the "Journal of the Anthropological Institute" for November, 1881. The extension of this singular practice, found in skulls of *Neolithic* age in Europe, to America, I consider to be a very important ethnological fact; and it is not a little noteworthy that, in one case at least, in Peru, the perforation is *square*, corresponding with the holes in the graves. In fact, the squareness of form which seems to prevail in America is a subject for inquiry, for it would appear to have a religious meaning, and would probably give a clue to the god to whom certain buildings were dedicated. In Europe I believe the square was sacred to gods of Hell, or the Under-World, but the same idea is not equally well defined in America,

<sup>1</sup> "Two Years in Peru," vol. ii, p. 49.

<sup>2</sup> "Mortuary Customs," Smithsonian Contributions, 1879-80, p. 118.

where the squareness appears to be extended to the sun-god; but the Peruvian figure may perhaps denote the moon.

Another curious fact revealed in the graves, especially of Peru, is the practice of distortion of the head in infancy. There is a legend relating to this given by Salcamayhua, to the effect that it was ordained by one of the Incas: "This Inca ordered the heads of infants to be pressed, that they might grow up foolish and without energy; for he thought that Indians with large round heads, being audacious in any enterprise, might also be disobedient." This practice, however, was very common in prehistoric times among various European and Asiatic races, and may be traced in some of the South Sea Islands. One of the Hamath hieroglyphics might represent an ancient Peruvian or modern Aymara.

The painting of the face for mourning, which prevails still among modern American races, is also probably a survival from ancient times, and it is worthy of note that the covering of the face, particularly of women, with white clay, prevails not only in the Andaman Islands and Australia, but also among one tribe in California,<sup>2</sup> where the paint used is formed from the ashes of the deceased husband, but generally the mourning colour in America is black. Another and very revolting burial custom of North America, that of scraping the flesh from the bones and placing it in a basket at the foot of the skeleton, which formerly prevailed among tribes of Virginia, the Carolinas and Florida,<sup>3</sup> may fairly be compared with the common Chinese ivory carving of a skeleton carrying his flesh sewed up in a basket; and another American custom, that of burning articles belonging to the deceased, in order that they may ascend to heaven in the smoke,<sup>4</sup> is strictly analogous to the Chinese practice.<sup>5</sup>

These analogies between the customs ancient and modern of the eastern and western hemispheres might be indefinitely extended, for they meet the inquirer everywhere; but the limits of this paper forbid my following them farther. Sufficient has, however, I think, been said to show that practices so identical and so widely extended must have had a common origin, for it appears to me impossible to imagine that *all* these things could have originated spontaneously in so many different centres. American anthropologists write generally in favour of the indigenous origin of American civilisation, and the monuments are indeed sufficiently distinctive; but I would argue from the vast

<sup>1</sup> Smithsonian Report, 1879, p. 337.

<sup>2</sup> Markham's translation, "Fables and Rites of the Incas," p. 76.

<sup>3</sup> The Yo-kai. See Yarrow's "Mortuary Customs," Smithsonian Contributions, p. 194.

<sup>4</sup> *Ibid.*, p. 131.

<sup>5</sup> *Ibid.*, p. 100.

accumulation of facts, that either the ancient prehistoric civilised peoples of America must have conveyed *their* ideas and customs to the Old World in some mysterious manner, or they must have received the germs of these ideas and customs from the eastern hemisphere. The route of such possible prehistoric intercourse is generally assumed to have been from China, or perhaps India, by way of the Pacific Islands, and the great monuments existing in many of these islands, evidently the remains of a race prior to the present inhabitants, certainly favour this theory; but there are difficulties in the way which must not be overlooked. And first the absence from these islands of all remains of pottery and metal tools, in the art of making both of which the Peruvians and Mexicans (if not the Central Americans and the mound builders) were expert, militates strongly against this opinion; but I do not think the environs of the great megalithic structures on these islands have been sufficiently explored to render it certain that such articles are wholly absent, although unknown to the present inhabitants. It is, however, possible that some of the many customs and beliefs common to America and Asia may have been conveyed by the Pacific route, whilst the arts of metallurgy and pottery may have travelled across the Atlantic, giving rise to those numerous coincidences which are found to exist between the religious myths and rites of sepulture in prehistoric Europe, Africa, and America; nevertheless, it must not be forgotten that it is in *Peru*, on the *Pacific* coast, that the pottery, as well as the religion and architecture, bears the stronger resemblance to those of the older prehistoric empires of Egypt, Western Asia, Asia Minor, and Greece, whilst in many other respects the affinity is great with China. Into this great and intricate problem I cannot now enter, but I believe that further investigations will eventually prove that in long bygone ages, as at the present day, there was a constant surging to and fro of peoples, sometimes by accidental migration, sometimes driven onward by enemies of a ruder race, yet always carrying with them fresh germs of thought, to be planted in new soil, to bring forth plants differing from those from which they originally sprang, although still bearing a family likeness to the parent stem.

I have not in this paper touched upon those points of resemblance so ably discussed by Dr. Tylor, Sir John Lubbock, Dr. Wilson, and others, my object being solely to bring forward those minor details which have not excited so much attention, but which yet seem to me to add much to the weight of evidence proving a prehistoric connection between the two hemispheres.

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The following papers were read by the Assistant-Secretary:—

*On some DOUBTFUL or INTERMEDIATE ARTICULATIONS:*

*An EXPERIMENT in PHONETICS.*

By HORATIO HALE, Esq.

IN many languages, as is well known, there are elementary sounds of an indeterminate character, which seem to float between two, and sometimes even three or four, diverse articulations. The American and the Polynesian languages afford many instances of this sort, which have much perplexed those who have attempted to reduce them to writing. A striking example is found in the Hidatsa (or Minnetaree) speech, a language of the Dakota stock, of which we have an excellent account by Dr. Washington Matthews. In this language, he informs us, "there are two series of interchangeable consonants—a labial series, consisting of *m*, *b*, and *w*, and a dental, or linguo-dental series, consisting of *d*, *l*, *n*, and *r*." Dr. Matthews regards the *m* as the "standard letter" of the labial series, and the *d* as the "standard letter" of the dental series, and the other letters in each series as mere variants of these. That is, the word *mia*, mother, may be frequently heard with the pronunciations *wia* and *bia*; and the word *dopa*, two, may be heard as *nopa*, *lopa*, and *ropa*.

In the Samoan and Hawaiian languages of Polynesia, spoken in the Navigator group and the Sandwich Islands, the linguo-dental series has almost as wide a range of variation. The *l* and the *r* are constantly interchanged, and frequently pass into the *d* sound. *Hilo*, the name of a district in Hawaii, has in past times, before the orthography was settled by the missionaries, been spelt *Hiro* and *Hido*. *Fale-alili*, the name of a place in the Navigator Islands, has in like manner been written *Fale-aridi*. In the Canienga (or Mohawk) language the sounds of *l* and *r*, of *g* (hard) and *k*, of *o* and *u*, are constantly interchanged. The word for man (or, rather, "he is a man") may be indifferently written *rongwe*, *rungwe*, *longwe*, *lungwe*, *ronkwe*, *runkwe*, *lonkwe*, or *lunkwe*.

In the Hawaiian a remarkable interchange occurs between the sounds of *t* and *k*. *Teiti* and *keiki* for child, *tanata* and *kanaka* for man, are heard, and were formerly written indifferently. The element is really the Polynesian *t*, as is shown by comparison with other languages of that stock. The Hawaiian, so far as is known, is the only language of this family in which this singular interchange of *t* and *k* occurs. The missionaries, it is said, were perplexed in attempting to determine whether to use the *t* and *r*, or the *k* and *l*, in the alphabet of this speech.



They finally concluded to submit the question to the king, who decided in favour of the *k* and the *l*. So far as the *l* was concerned, the choice was a matter of indifference; but the use of the *k* has had the rather unfortunate effect of somewhat disguising, in the written language, the close similarity which exists between the Hawaiian and the other idioms of Polynesia. The Rev. Wm. Ellis, the distinguished missionary writer, author of "Polynesian Researches," and other valuable works, visited the Sandwich Islands in 1823. Throughout his narrative the well-known names which are now written Kamehameha and Liholiho, are spelt Tamehameha and Rihoriho. In this orthography they correspond with the forms in the Tahitian language, with which Mr. Ellis was familiar.

To a student of languages, in considering these interchangeable sounds, there are three hypotheses which may occur. It becomes a point of considerable importance, in pursuing an inquiry in regard to the origin of the variation of languages belonging to the same stock, to determine which of these hypotheses is the correct one.

1. We might suppose that every member of a people speaking one of these languages uses these interchangeable sounds indifferently—that a Hidatsa Indian, for example, in uttering the word for mother, says at one time *mia*, at another *wia*, and at another *bia*, as the fancy may strike him, or the euphony of the sentence may seem to require; and so a Hawaiian may say *tanata* or *kanaka*, *Rihoriho* or *Liholiho*, according to his momentary caprice or some casual notion of euphony.

2. Another view might be that some speakers preferred one sound in the series, and others preferred one or other of its variants. One Hidatsa might usually say *mia*, while another more commonly pronounced the word *bia*, and a third was more accustomed to say *wia*; just as in English one speaker may pronounce the vowel in the word "aunt" with the broad sound of *a* in *far*, while another may give it the slender sound of *a* in *fat*; or as one person may omit and another pronounce the aspirate in "humble."

3. A third supposition would be that the difference of sound was not in the speaker's utterance, but in the ear of the listener; that the sound as spoken was an indistinct articulation, intermediate between the sounds represented by the two or more letters of each series, and that the hearer, unaccustomed to sounds of this peculiar character, involuntarily made distinctions where none really existed.<sup>1</sup>

Of the three theories thus suggested, the last would, at first

<sup>1</sup> The same subject is treated in Prof. Max Müller's Lectures on the "Science of Language," vol. ii, pp. 183-189.

thought, seem the least likely to be the correct one. Those who have studied the languages in which these uncertain sounds occur have generally adopted one or other—or sometimes both—of the two former suppositions. This, I must admit, was the case with myself, after considerable experience in this line of study. The third view, which supposes the discrimination of the sounds to be due, not to the speaker, but to the listener, had not occurred to me until it was forced upon my attention by the unexpected result of the experiment now to be recorded.

In July, 1872, I had the pleasure of spending a few days at the hospitable home of my friend, Professor Alexander Melville Bell, the distinguished author of "Visible Speech," and other esteemed philological works. Mr. Bell then resided near the city of Brantford, Ontario, at a short distance from the Grand River Reserve, which is occupied by the Canadian remnant of the Iroquois Confederacy. On one occasion we were joined by an intelligent Indian friend, Chief George Johnson, the Warden of the Reserve and Government Interpreter for the six nations. Chief Johnson was a well-educated man, a Mohawk chief of the highest rank, and spoke fluently the dialects of all the Iroquois tribes. The idea occurred to me of taking advantage of this opportunity to clear up, with the aid of the practised ear of Professor Bell, some doubtful points in Iroquois phonology. I proposed that we should take down a list of words in the Canienga (or Mohawk) dialect—Mr. Bell in the nicely discriminating alphabet of his "Visible Speech," and I in the method which I usually adopted in writing these languages. This was accordingly done, and the duplicate list, in Mr. Bell's manuscript and my own, was left with me for study and comparison.

The result was unexpected, and, as it seemed to me, instructive and valuable. In the languages of the Iroquois group, no distinction is made between the *r* and *l*. In the Canienga dialect the pronunciation seems to incline more to the sound of *r*, while in the softer Oneida speech the *l* sound appears to predominate. All the missionaries, Catholic, Anglican, and Methodist, though differing widely in some points of orthography, unite in using the *r* to represent this sound in the Canienga idiom. In the list of words which we wrote down this element occurred twenty-one times. Of these, I found on examination that I had written it ten times with *l*, ten times with *r*, and on one occasion had, in doubt, repeated the word with both orthographies. Mr. Bell had used the *l* nineteen times and the *r* only twice. In two cases in which he had employed the *l* sound he had adopted the character which represents the "non-sonant *l*," a delicate modification of that liquid which he discerns in the pronunciation of the French word *temple* and in the English *felt*.

From this statement it is evident that in eight words where I heard the sound *r*, Mr. Bell at the same moment heard the sound of *l*, either sonant or non-sonant. The conclusion appears inevitable that the sound which we heard was really neither *r* nor *l*, but an utterance midway between the two, and of such a character that to one listener it seemed an *r*, and to the other an *l*. One of the words, as has been stated, I wrote at the time in two forms *ro'niha* and *lu'niha*, meaning "his father." I was unable to decide which orthography most accurately represented the pronunciation I desired to preserve. This word was written by Professor Bell *lu'niha*.

It will be noticed that in writing this word I was uncertain both as to the first consonant and as to the first vowel. What may be called the "round vowel" sound (*o* or *u*, pronounced as in Italian) occurred in our list thirty-one times. I wrote it eighteen times with *o*, twelve times with *u*, and once—in the word just cited—with both *o* and *u*. Mr. Bell, with greater regularity, and probably a nicer ear, employed the *u* throughout. The Catholic missionaries, on the other hand, use only the *o*. The Protestant versions have *o* for the most part, but employ the *u* in a few words.

Many years ago, in taking down some of the languages of Eastern Australia from the lips of the natives, I ascertained the curious fact that their languages made no distinction between *e* and *i*, or between *o* and *u*.<sup>1</sup> They had, in fact, but three vowel sounds, which might be represented either by *a, e, and o*, or by *a, i, and u*, at the pleasure of the writer. The Iroquois make a clear distinction between the *e* and the *i*, which are not more frequently confounded in their dialects than in the Indo-European idioms. But between *o* and *u* in Iroquois no distinction exists, and from the evidence of the experiment now detailed it is clear that the sound is not a varying one, inclining at one time to *o* and at another to *u*, but a sound so exactly midway between the two as to perplex an English ear, and to lead two hearers to write the same utterance with different characters.

The Canienga language makes no distinction between the *k* and the *g*, or between the *t* and the *d*. The English missionaries use all these letters; the French missionaries employ only the *k* and *t*. The evidence of our list shows that the latter are most nearly accurate, as it is clear that in the native pronunciation the sound approaches more closely to the vowel than to the sonant utterance. Mr. Bell has written the *k* twenty-four times and the *g* only six times; he has the *t* twenty-six times, and the *d* four times. I wrote, in the same words, *k* throughout, and *t*

<sup>1</sup> All the vowels are to be sounded as in Italian or German.

in every instance but one—the word for “head,” which was written by me *onundzi*, and by Mr. Bell *unundzi*. The same word with a prefix (“my head”) was written by Mr. Bell *agenuntzinā*, and by me in two forms, *akenuntsine* and *akenundzine*.

The Iroquois language has a strong guttural aspirate, which the English missionaries express in some words by *h*, in others by *hh*, and in many instances by *gh*. The early Jesuit missionaries, as appears from Bruyas’s well-known work (*Radices Verborum Iroquæorum*), had also a threefold notation for this sound, employing sometimes the *h*, sometimes the Greek  $\chi$ , and sometimes the Greek *spiritus asper* (’). The modern French missionaries, after long and careful study of the language, have decided that all these sounds are but variations, real or apparent, of a single element, which they represent by *h*. The experiment now recorded shows not merely that this view is the correct one, but also that the variations are only apparent, and depend rather on the ear of the listener than on any actual difference of enunciation. In our list I have written the *h* twenty times and the stronger aspirate (here represented by *q*) six times. Mr. Bell in the same words heard only the *h*; but he in three instances employs what he terms in his system the “breath-glide” (which I transcribe by the *spiritus asper* ’) when I have used the *h* or the *q*. This occurs only in conjunction with the “non-sonant *l*,” (or *L*), as in *elhal’*, dog, which I have written *elhalh*, and in *kel’hite*, tree, which I wrote *keqlhite*. The aspirate and the liquid in these cases are so combined that it is difficult to say which is first uttered.

The first impulse of many persons on reading of these indeterminate vowels will doubtless be to account for them by the fact that the languages in which they occur are in the uncultivated or barbarous stage. Further consideration, however, will show that this view cannot be maintained. We know from the evidence of the Vedas, the Homeric poems, and the Moallakat, what was the state of the Sanscrit, the Greek, and the Arabic, at a time when the people who spoke these languages were unlettered barbarians. We are aware that the speakers of those tongues discriminated sounds with an accuracy and a variety which their more civilised descendants have failed to preserve. Further, we discover that many barbarous communities of the present day express delicate shades of pronunciation, which we can only with difficulty imitate. In the proper Dakota (or Sioux) language, for example, we learn from the excellent grammar of the Rev. S. R. Riggs, that not only are the surds *k*, *p*, and *t*, distinguished from the sonants *g*, *b*, and *d*, as in English, but that there is another distinction which does not

exist in our language. Each of the surds, as well as the composite sound which corresponds to the English *ch* in “chin,” has a strong explosive or emphatic utterance, which makes of it a distinct element. This difference of sound is indicated in Mr. Riggs’s alphabet by a dot under the emphatic letter. In default of these characters we may employ “small capitals.” The following list will show how accurately these barbarous speakers discriminated in their phonology :—

| Sonant.             | Surd.              | Emphatic.          |
|---------------------|--------------------|--------------------|
| be, <i>to hatch</i> | pe, <i>sharp</i>   | Pe, <i>elm</i>     |
|                     | ku, <i>to come</i> | Ku, <i>to give</i> |
| da, <i>to ask</i>   | ta, <i>moose</i>   | Ta, <i>to die</i>  |
|                     | cha, <i>when</i>   | Cha, <i>to dig</i> |

No instance of the sonant *g* is given, as that in the Dakota is merely a dialectical variation. The languages of the Maya, or Central American, family abound in nice distinctions of elementary sounds, which foreigners have a difficulty in acquiring. The Hawaiian, which confounds the *l* with the *r* and the *t* with the *k*, has preserved a peculiarity so apparently slight that the missionaries unfortunately have not deemed it worth indicating; and yet it is, in fact, of the first importance, both in science and in practical use. It is a hiatus, or catching of the breath, which shows where an element formerly in use has disappeared from the language. This element is the Polynesian *k*, which is still retained in the dialects of New Zealand, the Friendly Islands (Tonga), and some other groups, but has disappeared from those of Samoa, Tahiti, and Hawaii. Thus the original Polynesian *ika*, fish, becomes in Hawaiian *i’a*; *aliki* or *ariki*, chief, becomes *ali’i*, *kai*, to eat, becomes *ai*, and so on. The first missionaries to these islands were intelligent and well-educated men; but, accustomed only to the English pronunciation, they failed to notice this delicate trace of utterance, or did not think it worth indicating. They themselves never acquired it, though their children, born and reared in the islands, use it habitually, like their aboriginal companions. In the native pronunciation, the words *ao*, daylight, *a’o* (for the Polynesian *ako*), to teach, and *’ao* (for the Polynesian *kao*), to sprout, are plainly distinguished; but in the ordinary orthography of the language, all these words are confounded in one spelling *ao*. It is precisely as though the English language were to be written for the first time by persons who could not distinguish the aspirate. No difference would be made in their orthography between *heat* and *eat*, *hair* and *air*; and in reading



of the "edge" of a field, we should not know, from the spelling, whether the writer referred to its border or its hedge.

The same peculiarity is found in the Iroquois dialects, and has been equally neglected by the missionaries, except in one instance. The Rev. Asher Wright, the late accomplished missionary among the Senecas, who had a turn for philology, and especially for distinguishing sounds, has employed a peculiar character, a modification of the *h* (which we may represent by *h*) to indicate this hiatus. He remarks of it:—"This letter never precedes a vowel. Following one, it should be spoken by giving the vowel an explosive force, and breaking it off suddenly, in such a manner as for the instant to stop the breath entirely, as we often hear white people in hastily pronouncing the interjection Oh!—especially when they repeat it several times in rapid succession, in indicating to a child that it is doing something wrong. This sound is very abundant in Seneca, and, used in conjunction with certain other modifications, the mode and time of verbs, and various other circumstances, are denoted by it. Often, also, it forms the chief distinction between words of very dissimilar meaning. No one can read or write Seneca intelligibly who does not pay the strictest attention to this character and avoid confounding it with the rough aspirate of the common *h*."

Thus, among the examples, we find that *hahni<sup>h</sup>*, "my father" (speaking of him), has for its vocative form *hahni<sup>h</sup>*, "my father" (speaking to him). *Wa-a<sup>h</sup>*, "he said," differs only by the absence of this element in the first syllable from *wah-a<sup>h</sup>*, "she thought." In the Tuscarora an example given to me by an intelligent school-teacher of that nation was *ohsö<sup>h</sup>kwä*, "finger," which differs only in this element from *ohsö<sup>h</sup>kwä*, "lip." In the Canienga or Mohawk dialect, this hiatus was noted by both Mr. Bell and myself, though, as was natural in writing a strange language, we did not always remark it, and in some instances it was noticed by one and omitted by the other. I have usually represented it by an apostrophe, as in *iksha'a*, "child," *lu'niha*, "his father." Whether the hiatus indicates in the Iroquois, as in the Hawaiian, the loss of an element, or is a mere trick of utterance, is a question not yet determined.

Many languages which have been reduced to writing of late years, in America, Oceania, and Africa, have undoubtedly suffered a serious impoverishment in their phonology from the fact that the persons by whom they were first written were foreigners accustomed only to the European mode of utterance. If the Sanscrit had been first written by an Englishman, a Frenchman, or a German, it is very doubtful if the distinction between the lingual and dental elements would have been preserved. The Arabic, under the like circumstances, would

probably have suffered a serious deterioration in its dentals and its gutturals. The fortunate circumstance that Mr. Riggs was an accomplished philologist has preserved in the Dakota language distinctions that would probably otherwise have been lost. But for this "lucky accident," the readers of that language would have had no evidence of the difference of pronunciation which exists between *ku*, to come, and *Ku*, to give. *Da*, to ask, *ta*, a moose, and *Ta*, to die, might have been confounded in the Dakota, as *ao*, daylight, *'ao*, to teach, and *a'o*, to sprout, are now confounded in the Hawaiian. No one, probably, but a scholar familiar with the Semitic tongues would have distinguished and represented in the Dakota, the form of *g* which expresses "a deep sonant guttural resembling the Arabic ghain (غ) and the form of *h* which represents a strong surd guttural resembling the Arabic kha (ح)."

There are still many unwritten languages in Western Oceania and in Central Africa, for which alphabets will have to be provided. It will be fortunate if the persons to whom this important duty is entrusted shall be scholars trained in the scientific study of language. If this advantage cannot be secured, care may at least be taken that the work of settling the alphabet shall not in any case be entrusted to one person, however intelligent and well-instructed. The result of the experiment now recorded will show how essential it is that, to determine the real distinctions in the elementary sounds of a language, its words should be taken down by two or more persons, listening and writing simultaneously. In this way alone it will be possible to avoid, on the one hand, the danger of confounding sounds which should be kept distinct, and, on the other, that of finding distinctions where none really exist.

As regards the special results of this experiment, it will not be safe to infer that in all cases where such uncertainty prevails as is found to exist in the Iroquois and the Polynesian dialects in discriminating between sounds which to us seem widely different, this uncertainty is due to a lack of clear perception in the listener. It is highly probable that in some cases the pronunciation of the different natives, or of the same native at different times, actually varies. But the experience now set forth will at least serve to prove that this is not always, or perhaps usually, the case. We must recognise the fact, which has heretofore been overlooked, that in certain languages—and possibly in all languages—there are elementary sounds which affect so differently the ears of two listeners accustomed to a foreign speech, that in noting them they will be likely to use different characters to represent the same utterance. In other words, there are elements, in some if not in all languages, which

hold a middle place between two corresponding elements of some other language. And the sounds which these medial elements thus represent may even be as widely diverse as, according to our notions, the *r* is from the *l*, and the *t* from the *k*.

In our own language a singular instance of this peculiarity has been noted and well described in an article on Shakespeare by the distinguished philologist and Shakespearean commentator, Mr. Richard Grant White, which appeared in the *Atlantic Monthly* for June, 1884. Mr. White brings to notice the curious fact that in Shakespeare's time, and earlier, there were many English words in which the dental sound was written indiscriminately either with *t* and *th*, or with *d* and *dh*. He gives numerous examples, such as *stalwart* and *stalworth*, *fifth* and *fift*, *better* and *bether*, *hundred*, *hundret*, and *hundreth*, *swarthy* and *swarty*, *murder* and *murther*, *burden* and *burthen*; and he continues—speaking of his own edition of Shakespeare's works:—"It will be observed that in the Riverside Shakespeare, *murder* has both its modern spelling and the form *murther*. The variation is that of the old copies, which was purposely retained. The pronunciation was not *murther*, with the *theta* sound, which is poorly indicated by *th*, nor exactly that of *d*, but just that, I am sure, which has survived in the north of Ireland (carried there by English invaders, and chiefly by Cromwell's troopers), and which we have all heard, *murdher*." This acute suggestion of Mr. White gives us a case which is exactly in point. Every one who has heard the Irish pronunciation of the word in question is aware that it is such as one hearer might represent by *murder*, while another would prefer to spell it *murther*. In other words, it is an intermediate sound between the *d* and the *th*, exactly analogous to the intermediate elements which are found in the Iroquois and other languages.

The manner in which differences of dialect, and finally of language, might grow out of this peculiarity of pronunciation is evident. If an emigrating horde, whose speech possessed these indeterminate elements, were to conquer and absorb a tribe accustomed to a more precise mode of utterance, these indistinct articulations would, in the mingled race, tend to assume a fixed and positive character in one direction. A like result, though in a different direction of change, might happen in a second or a third migration, encountering and overcoming other tribes. Thus the Hidatsa people might send out three conquering colonies, in one of which the word for "mother" might come to be always pronounced *bia*, in the second *mia*, and in the third *wia*. If the original Aryan speech possessed intermediate articulations

of the kind now described, it is easy to understand how in the progress of the conquering migrations of Aryan hordes which absorbed the original populations of Northern India and of Europe, the varieties of pronunciation signalled in "Grimm's law," as well as many other changes, consonanted and vocalic, would gradually arise. These changes, with the accompanying alterations in grammar, and the inevitable acquisitions of new words from the idioms of the conquered tribes, would finally produce the various Indo-European languages.

The following is the list of words taken down by Mr. Bell and myself. It must be borne in mind that the words were written hastily, with only one hearing, and with no opportunity of revision. Under such circumstances some mistakes are inevitable, and must be allowed for. In the orthography here adopted, the consonants have in general their English sounds, and the vowels their Italian or German sounds. The *ç* is sounded like the *sh* in "shine," and *tç* represents the sound of *ch* in "chest." The *q* represents the German *ch* (Greek *χ*). The *à* is the *Urvocal*, or the short English *u* in "but." The French nasal *n* is indicated by a small *n* above the line, and the English nasal (*ng* in "song") by *ñ*. The apostrophe (') marks the hiatus, or sudden catching of the breath, already referred to.

I have added the corresponding words in the forms severally adopted by the Anglican and the Roman Catholic missionaries, the former written for me by an educated Mohawk, and the latter derived from the Iroquois Lexicon of the Rev. J. A. Cuog. For the purpose of comparison all the words are transliterated from the differing missionary orthographies into the alphabet employed in my own list. A study of these various forms, taken in conjunction with the facts of our experiment, will probably be found sufficient to establish the existence of several of those intermediate articulations whose part and influence in the phonology of language have been generally overlooked.

## CANIENGA (OR MOHAWK) VOCABULARY IN FOUR RENDERINGS.

|          | Bell.                | Hale.                 | English Mission.                            | R.C. Mission.                            |
|----------|----------------------|-----------------------|---|--|
| one ..   | à <sup>n</sup> skăh  | à <sup>n</sup> ska .. | à <sup>n</sup> skaht, or a <sup>n</sup> ska | à <sup>n</sup> skat, à <sup>n</sup> sha. |
| two ..   | těkinîh              | těkenih               | tekeni                                      | tekeni.                                  |
| three .. | ăqsà <sup>n</sup> .. | ahsà <sup>n</sup> ..  | ahsà <sup>n</sup> ..                        | aksu <sup>n</sup> .                      |
| four ..  | kayēlîh              | kayēlîh               | kayerih                                     | kaieri.                                  |
| five ..  | wisk ..              | wisk ..               | wisk ..                                     | wisk.                                    |
| six ..   | yāya'k'              | yāyak ..              | yayak ..                                    | isiak.                                   |
| seven .. | tyātăh               | tçatá' ..             | jadahk                                      | tsiatak.                                 |
| eight .. | sātēkū <sup>n</sup>  | sa'tēku <sup>n</sup>  | çadeko <sup>n</sup> h                       | sateko <sup>n</sup> .                    |

## CANIENGA (OR MOHAWK) VOCABULARY IN FOUR RENDERINGS—continued.

|               | Bell.   | Hale.   | English Mission.   | R.C. Mission.                                 |
|---------------|---|---|--|---|
| nine ..       | tyühtà <sup>n</sup> ..                                      | tiöhto <sup>n</sup> ..                                  | tyohdo <sup>n</sup> ..                                       | tiohto <sup>n</sup> .                         |
| ten ..        | uyéli ..  | oyéli ..  | oyerie. ..   | oieri.  |
| eleven ..     | a <sup>n</sup> skañawà <sup>n</sup> li ..                   | a <sup>n</sup> ska yawà <sup>n</sup> li ..              | a <sup>n</sup> skah <sup>t</sup> yawà <sup>n</sup> re ..     | à <sup>n</sup> skat iawà <sup>n</sup> re.     |
| twelve ..     | tegeniawà <sup>n</sup> li ..                                | tékeni yawà <sup>n</sup> li ..                          | tekeni yawà <sup>n</sup> re ..                               | tekeni iawà <sup>n</sup> ra.                  |
| twenty ..     | tewahshà <sup>n</sup> ..                                    | tewäqsà <sup>n</sup> ..                                 | tewahshà <sup>n</sup> ..                                     | tewasà <sup>n</sup> .                         |
| thirty ..     | ahsànewáhsà <sup>n</sup> ..                                 | aqسانیwäqsà <sup>n</sup> ..                             | ahsà <sup>n</sup> niwahshà <sup>n</sup> ..                   | ahsa <sup>n</sup> niwasà <sup>n</sup> .       |
| forty ..      | kayēliniwáhsà <sup>n</sup> ..                               | kayēliniwäqsà <sup>n</sup> ..                           | kayerih niwahshà <sup>n</sup> ..                             | kaieri niwasà <sup>n</sup> .                  |
| fifty ..      | wiskniwáhsà <sup>n</sup> ..                                 | wisk niwäqsà <sup>n</sup> ..                            | wisk niwahshà <sup>n</sup> ..                                | wisk niwasà <sup>n</sup> .                    |
| one hundred   | à <sup>n</sup> skah <sup>t</sup> ewà <sup>n</sup> -niäwi .. | à <sup>n</sup> ska tewà <sup>n</sup> -niäwe ..          | a <sup>n</sup> skah <sup>t</sup> dewà <sup>n</sup> -niawe .. | e <sup>n</sup> skat tewà <sup>n</sup> -niawe. |
| two hundred   | tēkinidewà <sup>n</sup> -niäwi ..                           | tēkeni tewà <sup>n</sup> -niawe ..                      | tekeni dewà <sup>n</sup> -niawe ..                           | tekeni tewà <sup>n</sup> -niawe.              |
| three hundred | ahsà <sup>n</sup> dewà <sup>n</sup> -niäwi ..               | ahsà <sup>n</sup> tewà <sup>n</sup> -niawe ..           | ahsà <sup>n</sup> dewa <sup>n</sup> -niawe ..                | ahsà <sup>n</sup> tewà <sup>n</sup> -niawe.   |
| one thousand  | uyēlitewà <sup>n</sup> -niäwi ..                            | oyēli tewà <sup>n</sup> -niawe ..                       | oyeri dewa <sup>n</sup> -niawi ..                            | oieri tewà <sup>n</sup> -niawe.               |
| my father ..  | rake <sup>n</sup> niha ..                                   | rake <sup>n</sup> niha ..                               | rakeniha ..  | rakeniha.                                     |
| thy father .. | ya <sup>n</sup> niha ..                                     | ya <sup>n</sup> niha ..                                 | yaniha ..  | hianiha.                                      |
| his father .. | lu <sup>n</sup> niha ..                                     | ro <sup>n</sup> niha, lu <sup>n</sup> niha ..           | roniha ..  | roniha.                                       |
| my mother ..  | istà <sup>n</sup> a ..                                      | ista <sup>n</sup> a ..                                  | isdà <sup>n</sup> ah ..                                      | istà <sup>n</sup> ha.                         |
| thy mother .. | sa <sup>n</sup> nistà <sup>n</sup> ha ..                    | sānistà <sup>n</sup> ha ..                              | sanisdà <sup>n</sup> ha ..                                   | sanistà <sup>n</sup> ha.                      |
| his mother .. | lu <sup>n</sup> nistà <sup>n</sup> ha ..                    | ro <sup>n</sup> nistà <sup>n</sup> ha ..                | ronistà <sup>n</sup> ha ..                                   | ronistà <sup>n</sup> ha.                      |
| my head ..    | agēnū <sup>n</sup> tzinà ..                                 | ākenū <sup>n</sup> tsine or akeno <sup>n</sup> dzine .. | akeno <sup>n</sup> djih or akeno <sup>n</sup> djineh ..      | akeno <sup>n</sup> tsi.                       |
| thy head ..   | zanūntsina ..   | sānu <sup>n</sup> tsine ..                              | sano <sup>n</sup> djih ..                                    | sano <sup>n</sup> tsi.                        |
| his head ..   | laūntsina ..  | raonu <sup>n</sup> tsine ..                             | raono <sup>n</sup> djih ..                                   | raono <sup>n</sup> tsi.                       |
| my hair ..    | agenū <sup>n</sup> kwis ..                                  | akenū <sup>n</sup> kwis ..                              | akeno <sup>n</sup> kwis ..                                   | akeno <sup>n</sup> kwis.                      |
| hair ..       | ūnū <sup>n</sup> kwis ..                                    | onū <sup>n</sup> kwis ..                                | ono <sup>n</sup> kwis ..                                     | ono <sup>n</sup> kwis.                        |
| head ..       | ūnūndzih ..   | onū <sup>n</sup> dzi ..                                 | ono <sup>n</sup> djih ..                                     | ono <sup>n</sup> tsi.                         |
| eye ..        | ūkālā <sup>n</sup> ..                                       | okara ..  | okara ..   | okahrn.                                       |
| nose ..       | u <sup>n</sup> nyū <sup>n</sup> sa ..                       | o <sup>n</sup> nū <sup>n</sup> sa ..                    | onyo <sup>n</sup> sa ..                                      | onio <sup>n</sup> sa.                         |
| teeth ..      | onāwi ..  | onāwi ..  | onawi ..   | onawira.                                      |
| ear ..        | uhū <sup>n</sup> ta ..                                      | ohū <sup>n</sup> ta ..                                  | oho <sup>n</sup> da ..                                       | oho <sup>n</sup> ta.                          |
| hand ..       | usnū <sup>n</sup> sa ..                                     | osnū <sup>n</sup> sa ..                                 | osno <sup>n</sup> sa ..                                      | osno <sup>n</sup> sa.                         |
| tree ..       | kēl <sup>n</sup> hite ..                                    | kēqlhite ..   | kerhide ..   | kerhite.                                      |
| dog ..        | ēlhal <sup>n</sup> ..                                       | ēlhalh ..   | erhar ..   | erhar.  |
| house ..      | kanū <sup>n</sup> sa ..                                     | kanū <sup>n</sup> sa ..                                 | kano <sup>n</sup> sa ..                                      | kano <sup>n</sup> sa.                         |
| town ..       | kanāta ..   | kanāta ..   | kanada ..  | kanafa.                                       |
| large town .. | kanatuwānā <sup>n</sup> ..                                  | kanatowānā <sup>n</sup> ..                              | kanadowanā <sup>n</sup> ..                                   | kanatowanā <sup>n</sup> .                     |
| man ..        | lu <sup>n</sup> gwe ..                                      | rūnkwe ..   | ro <sup>n</sup> gwe ..                                       | ro <sup>n</sup> kwe.                          |
| woman ..      | ikshā <sup>n</sup> a ..                                     | ikshā <sup>n</sup> a ..                                 | exhaah ..  | eksaa.  |
| husband ..    | lune ..   | lone ..   | rone ..  | rone.   |
| wife ..       | tiagenitelu <sup>n</sup> ..                                 | tiakenitelu <sup>n</sup> ..                             | teyagenidero <sup>n</sup> ..                                 | teiakenitero <sup>n</sup> .                   |
| white ..      | kā <sup>n</sup> lakā <sup>n</sup> ..                        | kā <sup>n</sup> rakā <sup>n</sup> ..                    | kā <sup>n</sup> rakā <sup>n</sup> ..                         | kārakā <sup>n</sup> .                         |
| black ..      | kahū <sup>n</sup> dzī ..                                    | kahū <sup>n</sup> tçi ..                                | kaho <sup>n</sup> jih ..                                     | kaho <sup>n</sup> tsi.                        |
| yellow ..     | utsinakwal <sup>n</sup> ..                                  | otsinekwal <sup>n</sup> ..                              | odjinekwar ..  | otsinekwar.                                   |
| red ..        | unēkwā <sup>n</sup> karā ..                                 | onekwā <sup>n</sup> tārā ..                             | onekwā <sup>n</sup> dara ..                                  | onekwā <sup>n</sup> tara.                     |
| green ..      | uhu <sup>n</sup> te ..                                      | ohūnte ..   | oho <sup>n</sup> de ..                                       | oho <sup>n</sup> te.                          |



*The CUSTOMS and the LANGUAGE of the IROQUOIS.*

By MRS. ERMINNIE A. SMITH.

FROM the days of the early Jesuit Fathers to the present time the general history and customs of the Iroquois tribes have been so faithfully chronicled that I may be pardoned if I present these people to you to-day only through their own medium of thought, their language.

It has been said, "A dead language is full of all monumental remembrances of the people who spoke it. Their swords and their shields are in it; their faces are pictured on its walls, and their very voices sing still through its recesses."

While the above has special reference to languages which have left a written record, it applies with even greater force to our aboriginal tongues, in which nearly every word contains its own little legend. Extremely interesting and important is the word-study of the Iroquois dialects, and through this study alone can we arrive at a correct knowledge of the people who used them.

Vocabularies giving a general interpretation are useless in comparison with a list of dissected words containing original Indian thought and Indian etymology.

Much time, I regret to say, has been lost by those who have analysed these words simply to trace their resemblance to words from Oriental families. Concerning this branch of investigation, I will venture to quote the conclusion of the celebrated etymologist, Skeat: "Mere resemblance of form and apparent connection in sense between languages which have different phonetic laws or no necessary connection are commonly a delusion, and not to be regarded." A closer study of these dialects proves in most instances the fallacy of striving to trace such analogies; *e.g.*, in a late work the Iroquois word *eh-tā'ke*, lit., "on earth," is compared with roots from tongues very far apart, said to signify "inferior." The Iroquois word in its applied sense means "down," and in its literal, "on earth"; from *o-he'tā*, field, earth, and *ke*, on; *o-he'tā'ke*, "on earth"; in no sense does it signify "inferior." Again, Professor Skeat says: "The whole of a word and not a portion only ought to be reasonably accounted for." In nearly all Iroquois work we find an almost total disregard of this important rule. Even Père Cuoq, who has done so much through his publications, fails in his *Lexique*, under the portion "Racines Iroquoises," to explain why he retains the incorporated pronouns and prepositions in the list of roots. Why not call them "words," and not "Iroquois roots"? And when these pronouns are dropped in composition,

why not explain that fact? Why should he in the verb *I-keks*, "I eat," say that the first *k* is servile, instead of calling it the first personal pronoun? In Bruyas's Dictionary, also, we find that when roots are given they are not separated from their pronouns, nor oftentimes from their tense signs. In the Dictionary of Père Marcoux he has given as the root the third person singular of the Indicative, but neither of the authors above referred to has adhered to any such rule.

The literal meaning of many Iroquois nouns is extremely interesting. The names of animals in very many cases refer to some peculiarity of the object. The rabbit, *Te-yo-hon-tā-ne-keñ-ha*, "It has two little ears together," alludes probably to the fact that when running the animal keeps its ears thrown backward and close together.

|                |   |  |
|----------------|---|--|
| An ox .. ..    | = | <i>Te-yo-ti-nā-'kā-es.</i><br>It has (two) long horns.           |
| A cow .. ..    | = | <i>Te-yoñ-nhos-kwaint.</i><br>It is pouch-mouthed.               |
| Rattlesnake .. | = | <i>Rhu-çāñ-'rhāñt.</i><br>He has to him a tassel.                |
| Snake .. ..    | = | <i>Rhu-'skwā'-na.</i><br>He squirms.                             |
| Mule .. ..     | = | <i>Te-wā-hoñ-'tes.</i><br>It is long-eared.                      |
| Lizard .. ..   | = | <i>Tā-tis'-tā-tis,</i> its note.                                 |
| Hog .. ..      | = | <i>Wāç-'kwā-rhā.</i><br>It immerses its mouth (lips).            |
| Sheep .. ..    | = | <i>Te-yo-ti-nā-kā-roñ-toñ-hā.</i><br>They have two little horns. |

The goat and some other animals are named from their odour. Birds generally from their note, as: the yellow-bird, *kā-tei-'ka'-u'*; the whip-poor-will, *kwa'-kurh-'ya''n'*. The oriole is called *tā-'kwi-yu*, meaning "large-thighed," and the goose *wā-te-ma''n-nyāks*, "It breaks its voice." Nearly all trees are named from some quality.

|                |   |  |
|----------------|---|--|
| Button-wood .. | = | <i>wā'-rhāñ-'nā-teññ-wā'-ti.</i><br>It is a self-smoothing tree. |
| Poplar .. ..   | = | <i>Wāt-āñ-'rhāññ-'ih-thā.</i><br>It swings its leaves.           |
| Alder .. ..    | = | <i>Yā-wa''-rhyāks-kā'-rhāññ.</i><br>It is hollow-hearted.        |
| Iron-wood ..   | = | <i>Rhuhs-na''-'ya''nç.</i><br>He is becoming lean.               |

Tears translate as "eye-juice," sugar as "tree-juice." The feelings and passions are even more strikingly descriptive.

He is in agony.. =  $\left\{ \begin{array}{l} Rhu-lâ^n-nha''-kârh-'ya^n. \\ \text{He eats his life.} \end{array} \right.$

A thing that is wonderful is scalp-raising; anything tempting, alluring, or captivating, is said "to unhook the mind."

Many homonyms occur, and some cause can generally be discovered to account for them, as in the case of the word "dandelion," which is the same as that for "sturgeon"; for when the flower makes its appearance in the spring it is the sign for the Tuscarora to take down his spear, and go to the capture of the sturgeon. The word *Rhu-nâ''-kânt*, "wood-chuck," is applied to the Irishman, who, through central New York, was first seen engaged in digging canals and throwing up earth for railway embankments. The interpreter for a person, or for a tribe, is sometimes called "Ear." Different peoples are named after the same fashion. The English, who were first seen coming from the direction of the dawn, received that name with the suffix *-â-kâ'*, which may be interpreted *ites*; whence we have—

*Nyurh-hâ''ç'-âkâ'*. = It dawns-ites.

The first regular hatchets were imported by the French, and furnished the name "axe-makers" to the people who bought them. The word Boston, which the Iroquois softened into *Wâs-'lâ'*, plays no mean rôle in Iroquois nomenclature. As Boston in the early days was an important rallying place for those Americans who first became identified as a nation, the Iroquois added to *Wâs-'lâ'* the *-â-kâ'*, which gives us *Wâs-'lâ''-â-kâ'*, or Bostonites, which thereafter represented to them the whole American people. The most important of all the dissectible or connotive words are those in which we find buried an extinct custom. Of such we have the word for hunting-dress, *ya''n-'nya''n-tâ-rhâ''kwâ'*, "what she puts on wood," from *o-ya''n-'tâ'*, wood, and *Rhu''-rhâ''n*, "He is arrayed in;" this alludes, no doubt, to the skeleton framework of wood worn by the hunter, over which he could throw the skin of whatever animal he wished to imitate, as he went forth with his concealed bow and arrows to the chase.

Another study is the Tuscarora, or rather Turquois, word for *warrior*, which analysed yields "bone-bearer." What may this signify? The Indians can no longer give an explanation. The word has become simply *denotive*. We can only surmise. Did the warriors of that olden time bear away from their conflicts the bones of their fallen comrades? Or did they superstitiously

carry about themselves some charmed bone to insure their victory ?<sup>1</sup>

Another suggestive word is the one for burial-ground :

*Wá'-náñ-náñ-érhú<sup>n</sup>* = They are sunk as to their trunks ;  
implying the *sitting* posture as the manner of burial. I  
might continue enumerating such modern words as—

Whiskey = Deformed liquid,  
Brandy = Real medicine,

and the word for renown, which is, in one of the dialects, the note of a bird which is constantly calling. But I will pass on to a short study concerning the pronouns in Iroquois, in the hope of obtaining an intelligent opinion upon certain points where I have ventured to differ from accepted forms. Allow me here to observe that I had already compiled chrestomathies in four of these dialects before having seen any of the valuable contributions of the French missionaries to this branch of Indian linguistics.

Two years since, when at Caughnawage, I obtained, through the courtesy of the Rev. Father Antoine, the Superior of the Order Oblat, and the most obliging missionary, Père Burtin, both celebrated Mohawk scholars, access to the invaluable Dictionary and Grammar of the late Père Marcoux, which books belong to the Mission. Upon examination of this Grammar I perceived that our principal point of difference was in the use of the pronouns, or rather in their distribution or nomenclature. The Mohawk Grammar of Père Marcoux follows the division made of that dialect by the early French Jesuits into two genders, a noble and an ignoble, a division of course necessitating a corresponding classification of the pronouns, which, however much it might facilitate a knowledge of the Iroquois to their own countrymen, would be folly for us to accept as a model for English students. The noble, or masculine, gender of these pioneers included men, angels, and God ; the ignoble, or feminine, included Satan, demons, evil spirits, animals, both male and female, things, and women. Modelled as nearly as possible after the French, and with this sweeping feminine gender, there was consequently no use for an *it*, which is not made to appear, but the indeterminate *on* of the French finds a place.

Mr. Hale, who has followed this classification, expressly says, "There is no neuter form in these dialects," &c. Against such weighty opponents my simple assertion would count for very

<sup>1</sup> Since this paper was written and read, Mr. Cushing has explained that it is still the custom among some Western tribes for the warriors to scrape the bones of their slain and carry them home for burial.

little; I will therefore present my reasons for assuming my position.

The use of the pronouns and their relations to one another may be considered as the greatest difficulties which the student of the Iroquois dialects has to encounter. The peculiarity of different words requiring unlike pronouns for the same person and number, and the great number of these arbitrarily used pronouns, have undoubtedly greatly puzzled most pioneers in Indian languages. Instead of the two genders, "noble" and "ignoble," we find in these dialects the masculine, the feminine, and the neuter genders—three instead of two. The simple proclitic pronouns of third person singular are the only words of the singular number that specify the gender of the objects to which they refer.

The simple third person masculine (*he*) has one form of the prefixive pronoun. It is always incorporated, and in Tuscarora it is *rhă-*, which, in some of the dialects, is aspirated into *ha-*. The sound *rh-* is a simple trill of the tongue; hence *rhă-* is nearly equivalent to *r-r-r-ă*, or *r-r-hă*, or *hă-*.

The simple third person feminine (*she*) has three forms, *yăk*, *k-*, *ye-*, or *yă-*; these are always found incorporated.

The simple third person neuter also has three, *wă-*, *kă-*, *yo-*, or *yu-*, which are also always incorporated.

The indeterminate, or indefinite, pronoun, is expressed separately, is indeclinable, and is never compounded with verbs, or their equivalents. The Tuscarora *Să-'kă-'nă'* is equivalent to, or is an exact synonym of, the Mohawk *oñ-'ka*, some one, somebody. This pronoun in the singular, when followed by its verb, which has no incorporated objective personal pronoun, expresses its gender through the verb's incorporated nominative, as, "Some one works" becomes "Some one *he*, or *she*, works," thus:—

|                                    |   |                      |
|------------------------------------|---|----------------------|
| <i>Să-'kă-'nă' rhu-yu-'nă'</i>     | = | Some one, he knows.  |
| <i>Să-'kă-'nă' kă-yu-'nă'</i>      | = | Some one, she works. |
| <i>Să-ă-wă-'nă' tă' yu-yu-'nă'</i> | = | Something, it works. |

The last form is used in speaking of animals or senseless things, but never when speaking of persons. The following are examples of the preceding rule taken from the Mohawk dialect:—

|                                |    |   |                           |
|--------------------------------|----|---|---------------------------|
| <i>O-the'-non wă-tho'-rătc</i> | .. | = | Something, it makes cold. |
| <i>Oñ-kă ok Ră-noñ'-wes'</i>   | .. | = | Some one, he likes.       |
| <i>Oñ-kă-ok ye-noñ'-we's</i>   | .. | = | Some one, she likes.      |
| <i>O-the-noñ kă-noñ'-we's</i>  | .. | = | Something, it likes.      |
| <i>Oñ-kă Ră-tkăh'-tos</i>      | .. | = | Some one, he looks.       |
| <i>Oñ-kă yoñ-tkăh'-tos</i>     | .. | = | Some one, she looks.      |
| <i>O-the'-noñ wă-tkăh'-tos</i> | .. | = | Something, it looks.      |



This is the only method of expressing in these dialects the indeterminate "on" of the French, in words which have no infixed object pronoun. In these words we are obliged, by the very nature of the Iroquois pronouns, to express clearly the gender of the "some one," or of the "something."

Upon pages 21 and 130 of the Grammar of Père Marcoux we find the following:—"On is the third person indefinite, and is found in all verbs and in all time," and in the conjugations of that Grammar the feminine *elle*, or *she*, is applied to all words representing things to which in English we would apply it, and the indeterminate *on* is made to serve under exceptions (for with his "Principes Fixes," Père Marcoux is ever consistent) for what, I feel convinced, is the feminine; therefore, I conclude that his feminine pronouns are in fact the neuter, and his indeterminate the real feminine pronouns which I trust will appear.

Upon page 81, "Essential Remarks upon the Use of Verbs," we find that "The third indefinite should be used in place of the third feminine, out of respect and politeness when alluding to women."

Thus by an exception he would allow us to use for the feminine what according to our table is the real feminine. Under this remark we find the following examples:—

*Ké'-ka''n' n'is'-těñ-hă'* .. = I see a person, my mother,  
for

*K-ka''n nis'-těñ-hă'* .. = I see *it*, my mother.

*Ye'-te-roñ* .. .. = She abides, is at home,  
for

*Kěñ'-te-roñ* .. .. = It abides, is at home.

(Under the general rule, this latter form would still stand for a woman.)

*Te-să-kô'-snié ne ro'-sol'-hă'* = He attends *one*, his grandmother,  
for

*Te-hô'-snié ne ro'-sol'-hă'* .. = He attends *it*, his grandmother,

*Ya'-kă-wěñ'-he'-yoñ* .. = She is dead,  
for

*Ya'-wěñ'-he'-yoñ* .. .. = It is dead.

In these examples Père Marcoux enforces the use of his *indeterminate* pronoun (which is our feminine) in the place of his feminine (which is our *it*), and in reality brings all woman-kind under their own pronouns, thus separating them from the surrounding of beasts, male and female, demons and things, with which he first environs them.

To what an emergency Père Marcoux was reduced to uphold consistently his division of gender, appears in the appended list

of idioms, in which he says (page 132), "It has been said in the first part that men alone were of the noble gender, and that the feminine gender belonged to women, animals, &c."

It is for this reason that *Ra-tcin* ("He is male") must be feminised when speaking of animals. Therefore, one says *Kā-tcin* ("She is male"). It is necessary to say that the translation which our classification of gender would allow for the latter, rendering the *Kā-tcin* "It is a male," is the correct one.

Again, upon page 56, under "Impersonal Verbs," Père Marcoux remarks that these verbs have but one person to each tense, and that this person is always the third person feminine. For instance, where in the French one would say "*Il pleut*," which in English must be translated *it rains*, not recognising an *it*, he gives his feminine, which appears on our table as the neuter; thus:—

|                                |    |    |   |                   |
|--------------------------------|----|----|---|-------------------|
| <i>Yo-ka''n-no'-rēs</i>        | .. | .. | = | It rains.         |
| <i>Yo-ka''n-no'-rēs</i>        | .. | .. | = | It rained.        |
| <i>A''n-yo-ka''n-no'-rēs..</i> | .. | .. | = | It will rain.     |
| <i>Ka''n-he'-yoñs</i>          | .. | .. | = | It is dying. (M.) |
| <i>Wā-ke'-ra''ns</i>           | .. | .. | = | It snows. (M.)    |
| <i>Wāñ'-tute..</i>             | .. | .. | = | It rains. (T.)    |
| <i>Kā-wā'-çrhāñç</i>           | .. | .. | = | It frosts.        |
| <i>Kā-tkwāñç..</i>             | .. | .. | = | It snows.         |
| <i>Kā-teā'-tus'-thā'</i>       | .. | .. | = | It makes it cold. |
| <i>Yā'-huks</i>                | .. | .. | = | It is light.      |
| <i>Wā'-nāte</i>                | .. | .. | = | It blows.         |

I will remark here that I have found no impersonal verbs, and that in each of the foregoing examples the full conjugation of each person, in the various moods and tenses, may be given as follows:—

|                           |    |    |   |                                  |               |
|---------------------------|----|----|---|----------------------------------|---------------|
| <i>K-ke'-ra''ns</i>       | .. | .. | = | I snow                           | (lit., pile). |
| <i>S-ke'-ra''ns</i>       | .. | .. | = | Thou snowest                     | "             |
| <i>Rā-ke'-ra''ns..</i>    | .. | .. | = | He snows                         | "             |
| <i>Ye-ke'-ra''ns..</i>    | .. | .. | = | She snows                        | "             |
| <i>Wā-ke'-ra''ns</i>      | .. | .. | = | It snows                         | "             |
| <i>K-ū'-nāte</i>          | .. | .. | = | I blow.                          |               |
| <i>S-ū'-nāte</i>          | .. | .. | = | Thou blowest.                    |               |
| <i>Rh-ū'-nāte</i>         | .. | .. | = | He blows.                        |               |
| <i>Yā-k-ū'-nāte</i>       | .. | .. | = | She blows.                       |               |
| <i>W-ū'-nāte</i>          | .. | .. | = | It blows.                        |               |
| <i>K-teā'-tus'-thā'</i>   | .. | .. | = | I make it cold, cool, I cool it. |               |
| <i>S-teā'-tus'-thā'</i>   | .. | .. | = | Thou, &c.                        |               |
| <i>Rhā-teā'-tus'-thā'</i> | .. | .. | = | He, &c.                          |               |
| <i>Yā'-teā'-tus'-thā'</i> | .. | .. | = | She, &c.                         |               |

|                         |                                 |
|-------------------------|---------------------------------|
| <i>Kā-tēd'-tus-thō'</i> | .. = It, &c.                    |
| <i>K-ā'n'-tutc.</i>     | .. = I rain, wet by sprinkling. |
| <i>S-ā'n'-tutc.</i>     | .. = Thou, &c.                  |
| <i>Rh-ā'n'-tutc</i>     | .. = He, &c.                    |
| <i>Yā-k-ā'n'-tutc</i>   | .. = She, &c.                   |
| <i>W-ā'n'-tutc</i>      | .. = It, &c.                    |

Upon page 69, Père Marcoux says: "The personal verbs may be used impersonally, as: *ioiānere*, 'it is good,' from *wakiānere*, 'I am good'; *ioteriwison*, 'it is a finished matter,' is a contract, an order, from *wā-kā-te-ri-wi-soñ*, 'I made a contract,' &c.; *io-nwē-sēñ*, 'it is pleasant,' from *wā-k-oñwē-sēñ*, 'I am agreeable,' pleasant, &c.; *io-tsā-nit*, 'it is terrible,' from *wā-kē-tsā-nit*, 'I am terrible,' &c."

The necessity which Père Marcoux here finds for impersonalising all verbs in order to give to the pronoun he has denominated *she* its proper neuter sense, in a manner divides gender into the three divisions which we have claimed for it. Furthermore, by thus impersonalising all verbs, causing the *she* always to represent the English *it*, and the indeterminate *on* to represent by exception the *she*, we find ourselves really occupying the same ground, Père Marcoux's arrangement suiting better the understanding of the French student, and the other certainly simplifying the language to the English student.

In the valuable Dictionary of Père Bruyas, no indeterminate "*on*" is recognised, and that author translates *i-wā*s, by the French *cela*, or that; *i-wā*, "*that* is as large as," and says that form is used *de rebus inanım*.

The old Onondaga Dictionary, published by Mr. Shea, does not in its numerous conjugations give any indeterminate pronouns. From the very best native authority in each one of the dialects I have received the confirmation of the existence of the pronoun *it*.

On page 399 of Morgan's "League of the Iroquois," we find the statement of the existence of three genders, also in the writings of Mr. Ashur Wright, who was so long a missionary to the Senecas. In conclusion, I will say that although I have given these pronouns exactly as I have taken them down from the best native authority in each tribe, yet it is not to be supposed that they are invariably used correctly; the most notable exception being the use of each of the singular third personal pronouns in place of the plural. This has probably arisen from the influence of the facts, first, that Philosophy has never *directly* aided in the formation, or establishment, of the general laws of language; and secondly, that in Iroquois there are no fully differentiated nouns which should correctly represent,

regardless of sex or gender, a collection, or community, of persons, or things animate, or senseless, that form, from common interests, conditions of being, customs, or habitation, or all of these combined, a single being, or individuality, so to speak. I will say that when the force of the singular feminine pronoun *she* is governed, or *restricted*, by the article, or by a noun of multitude, or by a plural suffix, as, *ni-yoñ*, or *na<sup>n</sup>*, or by all of these conjointly, *it* is, and may then be, employed *with its predicates*, as non-wholly differentiated collective nouns whose gender, or sex, is not necessary to the strength and the clearness of the context in which they occur. The pronoun *ya''* of the Tuscarora, and *ye* of the Mohawk and the other dialects, are, I believe, the only forms of the feminine pronouns used in these curious substantive predicates.

The following examples will serve, with slight or no changes of pronunciation, for any one of the dialects of the Iroquois:—

*Ya''* = *She*, is Tuscarora.

*Ye* = *She*, is common to the other dialects.

The names, or appellatives, of a tribe, people, or race, are "nouns of multitude."

*-ti-yoñ* (*-ni-yoñ*) and *á<sup>n</sup>* (*-tá<sup>n</sup>*) are plural distributive suffixes, having a peculiar force, &c.

*Ya''-tá'-krha''* .. .. = *She* inhabits, dwells, &c.

*Há''-ya''-tá'-krha''* .. .. = The people, nation, inhabitants.

*Ya''-tá'-krha''-ti-yoñ* .. .. = The peoples, nations, inhabitants, &c.

*Tu'-á'-ká''* .. .. = Senecas.

*Tu'-á'-ká'' ya''-tá'-krha''* .. .. = Seneca people, the S. people.

*Há'' Tu'-á'-ká'' ya''-tá'-krha''-ti-yoñ* .. .. } = The various peoples, tribes, &c., of Senecas.

The feminine singular does not include the regular plural, and in correct speaking is not much used. The masculine singular *he* is frequently used, for emphasis probably, instead of the pronoun *she*; the masculine dual and plural are often used when only one man is included.

Rather than be astonished at these apparent inconsistencies, let us wonder that there are so few in connection with the vexed question of pronouns. I have purposely avoided drawing any analogies or comparisons with the construction of other languages, or noting such parallel coincidences as the use of *sie* in the German for the pronouns *she*, *you*, and *they*, or alluding to the various vicissitudes of the English pronoun. I have taken

the language just as I found it, independent of any fixed principles, neither noting nor recognising any resemblances; and trusting that this paper will at least illustrate the difficulties in the way of conforming these fundamentally different dialects to the exact rules of any modern language, I offer it to the consideration of those interested in the languages of the American aborigines.

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*On the ANDAMAN ISLANDS, and their INHABITANTS.*

By E. H. MAN, Esq., F.R.G.S., &c.

(Read on May 13, 1884.)

IN considering the habits, customs, and physical peculiarities of a savage race, it is important to acquire as much information as possible regarding the land they inhabit, and also to ascertain the nature and extent of the influences exercised by, or resulting from, their intercourse with other nationalities. It is therefore my purpose to present the reader with a brief sketch, by way of supplement to my previous papers on the Aboriginal Inhabitants of the Andamans, which appeared in the "Journal of the Anthropological Institute" for 1882-3, giving a few of the many points of interest connected with the Andamans, and referring to the writings of Messrs. Ball, Hume, Kurz, and other specialists for information regarding the geology, ornithology, &c., of the islands, which subjects are deemed to lie somewhat outside the scope of this Journal.

The Andaman Islands, which till within the last hundred years were almost *terre incognita*, are situated in the Bay of Bengal, between the 10th and 14th parallels of N. lat. and near the meridian 93 E. of Greenwich; they comprise what are known as the Great and the Little Andamans, and, together with the Coco and Preparis Islands to the north, and the Nicobar Islands which lie to the south, form a volcanic chain extending between the province of Pegu and the northernmost point of Sumatra.

Great Andaman<sup>1</sup> is about 140 miles long, and includes not only the three main islands known as North, Middle, and South Andaman, but also the Archipelago, Interview, Rutland, and various lesser islets adjacent to its sea-board. At a con-

<sup>1</sup> For the probable derivation of the name "Andaman," the reader is referred to "Journ Anth. op. Inst.," vol. xii, No. 40, p. 70.



siderable distance eastward of Great Andaman, but connected with the group, are two small uninhabited islands known as Narcondam and Barren Island, both of which contain volcanoes, though the latter only is active at the present day. To the south, and about midway between Great Andaman and the northernmost point of the Nicobar group, lies Little Andaman, consisting of a single island about 27 miles in length, and varying in breadth from 10 to 16 miles; there are also a few small islets near its coast.

None of the islands exceed 20 miles in breadth, and the area of the entire group is estimated at about 2,508 square miles, four-fifths of which are comprised in Great Andaman.

Nearly all the high land occurs in the vicinity of the east coast, shelving gradually towards the west, where few, and those but minor, elevations are to be found. The principal hills are: Saddle Peak<sup>1</sup> (2,400 feet) in North Andaman, overlooking Port Cornwallis; Ford's Peak (1,400 feet) on Rutland Island; and Mount Harriet (1,100 feet) in South Andaman, commanding the harbour of Port Blair.

The climate of the Andamans much resembles that of Lower Burmah, and the temperature throughout the year is very uniform; the variation in the shade during the dry season is about 22°, and averages 17° during the remainder of the year; the extreme variation throughout the twelve months may be estimated at 26°, viz., between 70° and 96°. The cool season sets in during the last weeks of December and early part of January, and the hot season lasts through the months of March and April. The S.W. monsoon commences in the latter part of April or early in May, and usually terminates about the end of October, but on the change in the direction of the wind to N.E. heavy showers frequently occur for several weeks, and even, though at rare intervals, in January and February. The average number of wet days in the year is 182, and the rainfall 116 inches; the dry season is usually characterised during the first two months by strong winds from N.E., which cause sickness and prove equally prejudicial to vegetation. Although it has been ascertained that many of the most severe cyclones which have occurred in the Bay of Bengal during the past twenty-five years have had their origin in the immediate vicinity of the Andamans, only one is recorded (viz., in 1864) as having visited the islands themselves; in the same period there have been a few earthquakes, the first of which mention is made took place in August, 1868, and the next in February, 1880, from which time several slight shocks were felt until, in December (31st), 1881, another severe earthquake visited the group, the effects of which were

<sup>1</sup> The only ascent on record of Saddle Peak was made in February, 1882, by Major M. Protheroe, C.S.I., and other officers of Port Blair.

experienced on both the Indian and Burman coasts; another, though slighter, shock was felt on February 27th, 1882.<sup>1</sup>

Among the many noteworthy features of these islands are the numerous harbours in which, especially on the east coast, safe anchorage can be obtained at all seasons of the year; the most important and best known of these harbours are: Port Blair in South Andaman, and Port Cornwallis<sup>2</sup> in North Andaman; of both it has been said they may be classed among the finest harbours of the world, affording ample accommodation as well as shelter to even "half the British navy," in addition to which, from their central position in the Bay of Bengal, they present great advantages to vessels in need of refitting, and also as ports of refuge.

The water<sup>3</sup> in the harbour of Port Blair has been found to be remarkable for its high density, as is evidenced by the rapid oxidation of iron immersed in it; its extreme clearness has also attracted the notice of many, who have viewed through its pellucid depths the wonderful coral beds which abound in certain parts of the coast. The marvellous variety of the colouring to be found among these corals must be seen to be appreciated, but some idea of their wondrous beauty may be formed from the following extract:—"As we steamed along, visions of the splendours of the submarine world broke upon our view; . . . I feel quite unable to attempt the task of describing, much less conveying an adequate idea of the exquisite assortment of colour, of the varied forms of life which were included in every square yard of these tropical coral reefs. The most gorgeous combination of vegetable and animal life afford but a poor sub-aërial representation of these submarine gardens."<sup>4</sup> But to return.

<sup>1</sup> On the occasion of the disastrous earthquake in the Straits of Sunda (August 26th, 1883), a report as of a distant signal gun was heard at Port Blair at about 9 P.M. of that day, followed by several similar reports at irregular intervals during the next two days. It was thought at the time that a vessel was wrecked off the coast, and the station steamer was sent out to render assistance; at 7 A.M. on Monday (27th) the sea rose and receded thrice in the course of a few minutes.

<sup>2</sup> This was the harbour selected in 1824 as the rendezvous of the fleet conveying the expedition under Sir Archibald Campbell to Rangoon during the first Burmese war.

<sup>3</sup> The supply of water from the tanks and wells in the Settlement is pronounced on medical authority to be both good and plentiful, and no diseases have ever yet been traced to the use of these waters.

<sup>4</sup> *Vide* "Jungle Life in India," pp. 359-360, by V. Ball, Esq., F.R.S. The vivid description by the same writer of a coral reef at the Nicobars (*vide* p. 202) is so applicable also to those at the Andamans, that I feel the reader will thank me for appending it in this place:—"There are corals which in their living state are of many shades of fawn, buff, pink, and blue, while some are tipped with a majenta-like bloom. Sponges which looked as hard as stone, spread over wide areas, while sprays of coralline added their graceful forms to the picture. Through the vistas so formed, golden-banded and metallic-blue fish meandered, while on the patches of sand here and there the *holothurians* and various mollusca and crustaceans might be seen slowly crawling."

The other harbours which may be mentioned are: Stewart's Sound, Port Campbell, Port Mouat, Kyd Island Bay, Port Andaman, and the Bay between South Andaman and Rutland Island. There are besides many good anchorages, and several navigable channels have been discovered by successive commanders of the Settlement steamer, but in the absence of any other guide than Blair's old chart, which as relating to a coral-bound coast must require considerable revision at the present day, and with the knowledge that the extent of the shoals and reefs<sup>1</sup> is only approximately indicated in many parts, those unacquainted with the coast find it necessary to take a circuitous route and to exercise great care in proceeding from one point to another, especially on the northern and western shores, where the coral banks and reefs are known to extend as far as twenty miles seaward. Several creeks on the three main islands of Great Andaman are of a sufficient size to allow of the passage of boats for a considerable distance into the interior, and though of course these are of no little importance in opening up a country like the Andamans, they are chiefly valuable as affording a natural channel for the conveyance of produce from the extensive tracts of rich land<sup>2</sup> in their immediate vicinity, in lieu of the costly and indifferent land carriage which in the absence of such waterway would have to be substituted.<sup>3</sup>

The natural beauty of the scenery of the Andamans never fails to awaken the admiration of every visitor, and has been deservedly eulogised by various writers, one of whom (Prof. Ball) says: "Of all the places I have seen in Europe, Killarney can alone convey an idea of these scenes. The blue waters, the luxuriant emerald green vegetation down to the margin of the coast, and the passing showers which brighten all the aspects of nature, have their counterpart here."<sup>4</sup>

Various theories have been advanced with regard to the origin and affinity of the aboriginal population of the Andamans, but no certain information is obtainable in the matter. The statements of the early Arabian travellers, and also of Marco Polo, give grounds for believing that the Andamans were inhabited

<sup>1</sup> These are formed chiefly of *Caryophyllia*, *Madrepora*, *Porites*, *Meandrina*, and other reef-forming corals (Kurz).

<sup>2</sup> By means of a comparatively light embankment, these lands are capable of cultivation to the very borders of the creek.

<sup>3</sup> Probably ignorance, and not disregard of these and other considerations which might be adduced, has led to the suggestion by some visitors (including two able officers of long standing) that the bunding of the deep mouths of such creeks would prove highly advantageous by adding largely to the area of land suitable for paddy cultivation; had, however, their observations been made during the rains instead of during the dry months, their opinions would doubtless have been considerably modified.

<sup>4</sup> *Vide* "Jungle Life in India," by V. Ball, Esq., F.R.S., p. 362 (1880).

centuries ago by the progenitors of the present race, and afford (apart from the knowledge that the interior of the Malayan Peninsula, as well as of the Philippine Islands, has been from very distant times occupied by Negritos closely resembling if not also closely allied to the Andamanese) strong *prima facie* evidence against the somewhat plausible tale which found credence at one time—*i.e.*, that these islands were originally peopled by a cargo of African slaves saved from the wreck of a Portuguese ship. It is surprising that this hypothesis, which has long since been disproved, should have ever been entertained, for, as Professor Owen has observed, “it is to be presumed that the Portuguese would import from the Guinea coast, or other mart of Negro slaves, individuals of the usual stature, and it is incredible that their descendants, enjoying freedom in a tropical region affording such a sufficiency and even abundance of food as the Andamans are testified to supply, should have degenerated in the course of two or three centuries to the characteristic dwarfishness of the otherwise well made, strong, and active natives<sup>1</sup> of the Andaman Islands.”<sup>2</sup>

The persistence with which travellers and writers, from the earliest times<sup>3</sup> to a comparatively recent date,<sup>4</sup> have maintained that these aborigines are anthropophagi would be remarkable were it not a common experience that idle tales, especially when of a prejudicial character, have always been readily accepted,

<sup>1</sup> The following remarks, which appeared in a report of a lecture delivered by Professor W. H. Flower, F.R.S., will be read with interest in this connection:—“It is very possible—but this is purely hypothetical—that the Andamanese, whose geographical position is almost midway between either extremes of the range of the woolly-haired races, may be the unchanged or little modified representatives of a primitive type from whom the African negroes on the one hand, and the Oceanic negroes on the other, have taken their origin, and hence everything connected with their history or structure becomes of the greatest interest to anthropologists” (*vide Brit. Med. Journ.*, May 3, 1879).

<sup>2</sup> Prior to 1879 the theories which had been advanced to account for the colonisation of the Andamans by their present peculiar inhabitants were summed up by Dr. Dobson, F.R.S., as follows:—

The present inhabitants of the Andamans are—

- I. The descendants of shipwrecked negroes escaped either from some Arab slave-ship carried out of its course by adverse winds, or from a slave-ship wrecked on the Andamans on its way to the Portuguese Settlement in Pegu (Symes’ “Embassy to Ava,” *Calcutta Monthly Register*, 1790).
- II. Aborigines not connected on any anatomical grounds with the people of any existing continent (Owen).
- III. Negritos—negroes (Huxley).
- IV. Negritos or Semangs from the Malaya Peninsula (Wallace).
- V. Mincopie branch of the Negrito division of an original negro stock (Quatrefages).

<sup>3</sup> *Vide* Colonel Yule’s “Marco Polo,” vol. ii, p. 251.

<sup>4</sup> *Vide* Mouat, p. 71, and W. W. Hunter, who writes: “During the next half century (*i.e.*, from 1796) the Andamans appear in the records only as a cluster of cannibal islands” (*vide Imperial Gazetteer of India*).



whether they relate to individuals or to races; the origin of the belief in this instance may possibly be traceable to the inveterate hostility which they have manifested towards all strangers approaching their shores, but for which abundant excuse can be found in the accounts given by Capt. Miller<sup>1</sup> of the malpractices of the Malay and Chinese traders who visited these islands in search of *bêche de mer* and edible birds' nests.

To this belief may in all probability be also attributed the fact that these islands were avoided by most voyagers, and hence no records exist with reference to their history prior to the close of the last century, when the Honourable East India Company, recognising the advantages which the group afforded for a penal colony, sent down Lieutenant Blair (who had previously been commissioned to survey and report upon the islands) in charge of a small expedition and with instructions to provide for the reception of prisoners.

A Settlement was accordingly formed at Port Blair, then known as Port Cornwallis, where Blair displayed much energy and skill in his arrangements. After a brief residence of three years, during which the colony enjoyed excellent health, and Blair was able to report favourably of his relations with the aborigines,<sup>2</sup> orders were received from Calcutta for the removal of the entire establishment to the magnificent harbour in North Andaman, where it was proposed to form a Naval Arsenal. The transfer was effected in 1792, and the newly occupied station was named Port Cornwallis, while the recently abandoned Port was styled "Old Harbour," by which name it continued to be known till 1858, when, at Dr. Mouat's suggestion, it was appropriately changed to Port Blair. The new site selected for occupation, despite its apparent natural advantages, proved most unhealthy, and a year had hardly elapsed before it became evident that the change from South Andaman had been ill-advised; it was not, however, till February, 1796, that, in consequence of the continued sickness and high death rate, Government finally decided upon the abandonment of the colony, and the removal of the prisoners (numbering 270) to Penang, while the free settlers and troops were conveyed back to Bengal.

From this date the islands remained unoccupied by aliens for

<sup>1</sup> *Vide* Mouat, p. 22, and "Journ Anthropol. Inst.," vol. xii, No. 42, p. 339.

<sup>2</sup> Both his account and that of Lieutenant R. H. Colebrooke, who visited the islands about the same time (if not actually in each other's company), were published, the latter appearing in vol. iv. of the "Asiatic Researches." Although the accounts furnished by them do not in all respects accord with our present knowledge of the habits of these savages, it must be borne in mind that, apart from the difficulties which attend inquiries prosecuted as were theirs, with but little or no acquaintance with the language spoken by the savages, various changes or modifications have probably occurred during the long lapse of years which may account for many seeming discrepancies.



sixty-two years, during which period all that is known regarding them or their inhabitants was derived from accounts published of casual visits paid by Government or trading vessels;<sup>1</sup> but as these add little to our information it is unnecessary to particularise them further than to say that they confirm the reports furnished by Colebrooke of the degraded condition of the savages and their inveterate hostility towards all strangers.

The modern history of the Andamans may be said to date from the latter end of 1857, when the scheme of founding a penal settlement and harbour of refuge in these islands, which had been under consideration for a few years, was precipitated by the events connected with the Sepoy mutiny. A Commission, composed of Dr. F. J. Mouat as President, and Dr. G. Playfair, A.M.S., and Lieutenant J. A. Heathcote, of the Indian Navy, as members, was despatched at this time with instructions to explore the coasts of these islands, to examine how far they were adapted for the establishment of a convict station, and to select a suitable site for such a Settlement.

Leaving Calcutta on the 23rd November, and travelling *via* Moulmein, Dr. Mouat and his colleagues reached Port Cornwallis on the 11th December; they thence visited in succession Stewart's Sound, Long Island, Barren Island, Old Harbour, McPherson's Strait, Cinque Islands, Labyrinth Islands, Port Mouat, Port Campbell, Middle Strait, and finally Port Andaman, making careful observations at each of these localities, in the course of which many adventures with the aborigines occurred, the only untoward one being at the last stage of the expedition and on the last day of the old year, when an encounter provoked by the savages took place which resulted in a few of them being killed and wounded and one being taken captive.<sup>2</sup> The Commission returned to Calcutta early in the new year (1858), and at once submitted their report; they advocated the selection of Old Harbour as being admirably suited for the purposes of a penal Settlement, and suggested that the name of this harbour might be appropriately changed to "Port Blair," in honour of the distinguished hydrographer.

In recognition of the excellent services performed by the Commission the special thanks of the Supreme Government were

<sup>1</sup> The three chief incidents recorded and mentioned by Mouat are—1. The rendezvous at Port Cornwallis in 1824 of the fleet conveying the troops for the first Burmese war; 2. The visit and treacherous murder in 1839 of Dr. Helfer, a savant engaged in scientific researches; and 3. The extraordinary shipwreck in 1844 at Havelock Island of the troopships "Briton" and "Runnymede."

<sup>2</sup> This lad was taken to Calcutta, where he naturally excited great interest and curiosity. After a short detention he was conveyed back to the very spot which had witnessed his capture, but, owing to the kindness with which he had been treated, he appeared loth to part with his captors.

conferred upon Dr. Mouat and his colleagues for the judicious, prompt, and effectual manner in which they had carried out their instructions, and the business-like and practical shape in which they had embodied their investigations.

The Government lost no time in acting upon the recommendation of the Commission, and orders were at once sent to Captain (now General) H. Man, then on duty at Moulmein, to proceed to Port Blair and hoist the British Flag and take possession of the Andaman Islands in the name of the Honourable East India Company; before his return Captain Man was also to make arrangements for the immediate reception of a large party of convict mutineers whom it had been decided to transport thither without delay.

These instructions were duly carried into effect: the flag was hoisted on the 22nd January, and sixteen days later the first party of prisoners, numbering 200, arrived in charge of Dr. J. P. Walker, who had been appointed Superintendent of the new Settlement. During the first decade of the colony (1858-1867) the rate of mortality among the settlers was excessive, the annual average amounting to no less than 18·56 per cent., while in one year (1859) it will be seen from the annexed table to have reached the terrible figure of 63 per cent.

| Year.   | Death rate<br>per cent. | Year.   | Death rate<br>per cent. |
|---------|-------------------------|---------|-------------------------|
| 1858-59 | 16·00                   | 1871-72 | 1·72                    |
| 1859-60 | 63·00                   | 1872-73 | 1·64                    |
| 1860-61 | 13·40                   | 1873-74 | 1·51                    |
| 1861-62 | 14·25                   | 1874-75 | 2·51                    |
| 1862-63 | 15·53                   | 1875-76 | 3·67                    |
| 1863-64 | 21·55                   | 1876-77 | 4·17                    |
| 1864-65 | 14·64                   | 1877-78 | 4·90                    |
| 1865-66 | 6·57                    | 1878-79 | 6·73                    |
| 1866-67 | 10·56                   | 1879-80 | 4·63                    |
| 1867-68 | 10·16                   | 1880-81 | 5·12                    |
| 1868-69 | 3·9                     | 1881-82 | 4·85                    |
| 1869-70 | 2·0                     | 1882-83 | 3·3                     |
| 1870-71 | 1·2                     |         |                         |

This extraordinary fatality was of course chiefly due to circumstances incidental to the establishment of a penal Settlement in an isolated tropical region peopled by hostile savages and covered by dense jungle largely fringed with mangrove, and rendered extremely malarious by numerous salt and fresh water swamps which are found throughout the group.

The necessity of clearing and occupying without loss of time

the most commanding localities in the fine harbour of Port Blair, and reclaiming as far as possible the contiguous swamps, naturally led to much sickness, which was aggravated by various other circumstances, of which the following were doubtless the chief:—

1. Transportation of a large number of prisoners unfit either to withstand the climate or to perform the work required of them under the exceptional circumstances in which they were then placed.
2. Want of sufficient nitrogenous food.
3. Absence of a sanatorium for the recovery of invalids.
4. Employment of convict labour on works of every kind throughout the year without respect to the suitability of the season for those involving exposure to malarious influences, as evidenced by the mortality in the rains having about trebled that of the dry months.
5. Difficulties experienced by working parties in consequence of the harassing attacks of the aborigines.

The above facts being at length recognised as calling for stringent measures of reform, active remedial steps were at once taken by the then recently appointed Superintendent,<sup>1</sup> with the remarkable result that the death rate suddenly fell from 10·16 in 1867 to 3·9 in 1868, while an average of 1·6 in the five following years, during which vast clearings of jungle and other important works were accomplished, testified to the vigour and success with which the wise and considerate system which had been inaugurated was carried on.

Prior to the formation of our Settlement in 1858, and for some years after, it is clearly shown, from the early records of our relations with the aborigines, that extreme jealousy and distrust prevailed among adjacent tribesmen, and even among scattered communities of the same tribe; these feelings naturally resulted in restricting intercommunication, and it is therefore not surprising to find that in many cases no knowledge was possessed regarding tribes distant only fifteen or twenty miles.<sup>2</sup> Of the *āko-jūwai*-, *ākā-ked-e*-, *ākā-jāro*-, and *ākā-chārār*-tribes, those living in South Andaman remained in ignorance till 1877, and it was not till 1879–80 that members of all the eight tribes of Great Andaman (*i.e.*, including the *ākā-bal'awa*- of the Archipelago) were able to meet on friendly terms at the various Homes which had then been established for some years.

<sup>1</sup> Colonel (now General) H. Man.

<sup>2</sup> In 1875 it was found that the *bō-jig-ngī-jī*- (or South Andaman tribe) had only then recently discovered that Middle Andaman was not, as they had supposed, occupied entirely by the *ākā bō-jig-yāb*-, but that it was shared by another tribe called *ākā-kāl*-; of the territory further north all they were able to say was that it was occupied by the *yērewa*-, a people they seem to dread equally with the natives of Little Andaman.

From the very commencement of the new Settlement, as has been stated, serious difficulties had to be contended with in consequence of the harassing attacks on our working parties by the aborigines, whose cupidity was excited by the iron tools and other implements which in their eyes presented an appearance of adaptability as weapons of the chase; the Government Gardens they likewise freely robbed, until at length stern repressive measures had to be adopted whereby they were instructed for the first time in the laws of private property. A wholesome dread of our power having been duly instilled, efforts were made by Government with a view to the civilisation of the race and the establishment of a better understanding between ourselves and the original possessors of the soil. Homes were accordingly erected in the vicinity of the harbour, where all who needed might obtain protection, shelter, food, and medicine. This step, which was deemed the best, if not the only means of furthering one of the objects which had prompted the re-establishment of the colony—*i.e.*, of reclaiming the savages from their barbarous custom of murdering all strangers who approached their shores—effected a marked improvement in our relations with the tribes in South Andaman<sup>1</sup> by affording them convincing proof of our friendly intentions towards them, so that now, as Dr. Day has stated, “the convicts are left unmolested, the implements of agriculture are not stolen, the fishing stakes are left undisturbed, the gardens are no longer pillaged, runaway convicts have been recaptured, and shipwrecked sailors assisted.”

It must not, however, be supposed that these beneficial results were immediately obtained, for it could hardly be expected that the aborigines should at once believe in our goodwill towards them, or forget their resentment against the people who had taken possession of their fine harbour and ousted them from many of their favourite haunts; in process of time, however, the kind and judicious treatment they consistently met with, first from Rev. H. F. Corbyn, and during ten subsequent years from Mr. J. N. Homfray, had the desired effect, and they have learned not only to regard us with favour, but also to assist us in a variety of ways.

<sup>1</sup> Recently (July, 1883) four men and two women were forwarded to Calcutta for the purpose of being modelled for the International Exhibition; while there they were quartered for a few weeks in the Zoological Gardens, where they attracted great crowds of Bengalis, who had never before had an opportunity of seeing the people whom they are said to regard as the descendants of the Rakshasas (!) Circumstances proved that their Port Blair training had not been lost on these representatives of their race, for on being asked by their visitors for a souvenir in the shape of a lock of their corkscrew ringlets, they promptly demanded a rupee before granting the favour; and in like manner the pleasure of witnessing an Andaman dance was not to be obtained previous to some *ik-pū-ku* (money, lit. “slices”) having been bestowed upon the performers!

To Mr. Homfray great credit is due for the zeal and energy he displayed in conciliating the members of the various tribes who visited the Homes: he spared neither time nor his private means in promoting their welfare and gratifying their wants, and so thoroughly identified himself with their concerns and interests as to gain their entire confidence and goodwill; he also acquired a fair colloquial knowledge of the South Andaman language, but abandoned an attempt he made to form a vocabulary. As Mr. Homfray's labours may be fairly said to have paved the way, and rendered easier the task of conducting ethnological and philological researches among the aborigines, it is due to his memory that this slight acknowledgment should be here made of his good services.<sup>1</sup>

The Homes have effected good by bringing together members of the various tribes, between whom the way has thus been paved for intermarriages, which were of course formerly of rare occurrence; tribal feuds have also here been amicably arranged, while, through visits paid to Port Blair and other Homes by members of all the Great Andaman tribes, as well as by our visits in the station steamer to the more distant encampments, the knowledge of our power, resources, and kindly intentions has spread throughout their respective territories.

It cannot, however, be contended that our attempts to reclaim the Andamanese from their savage state have produced unmixed beneficial results, for it is found that in proportion as they gain in intelligence and tractability, the more fat and indolent do they become, and having no incentive towards exertion frequently lose in great measure their quondam skill in hunting;—availing themselves of the privileges of free board and quarters, they spend their time for days together in singing, dancing, and feasting; the spirit of independence becomes thus less conspicuous, as they learn to depend upon others for the supply of their daily requirements, instead of being compelled to make such provision for themselves. There can, moreover, be no doubt that the effect of our clearances of jungle has been prejudicial to the health of the aborigines, while the excessive tobacco-smoking<sup>2</sup> among members of both sexes, which has been unrestricted, has seriously undermined their already enfeebled constitutions. If the evil ended here there would be ground for regret, but a graver cause exists in the deterioration which has taken place in their morals through

<sup>1</sup> Mr. Homfray died suddenly at Port Blair on February 25th, 1883, after twenty years' service in the Settlement.

<sup>2</sup> It is pitiable to notice the evident disrelish and discomfort endured by one of these savages when first given a pipe of tobacco, yet from sheer determination to share an experience which has such apparent attractions for their compatriots they willingly undergo the misery of nausea for several days till they have habituated themselves to its use.



their unavoidable contact with the alien convict population, the lamentable consequences of which will be found under the head of "Pathology."<sup>1</sup> So widespread is the evil influence that has been exercised, that on no point probably will future writers differ so strongly as on the social and moral virtues of the Andamanese. I wish, therefore, to make it clear to my readers that my remarks and observations on all, and especially on these points, are restricted to those communities who have been found living in their primitive state, and who may therefore be fairly considered as representatives of the race, being unaffected by the virtues or vices of so-called civilisation.

The measure of success which was considered to have attended the establishment of the Homes suggested that further good might be effected by the formation of a school or Orphanage for the education of the younger members of the aboriginal population. Accordingly in 1866 a commencement was made with a few children who had been obtained by Mr. Homfray from their guardians or relatives, and who were now placed under the care of a matron on Ross Island, where the Orphanage was opened. In 1870 two ladies from the Kidderpore Asylum (Calcutta) undertook the charge of the Orphanage, in which there were at that time more than forty children of both sexes. For some months the nature of the instruction given was of course of the simplest, comprising chiefly habits of neatness and cleanliness, the alphabet, and a little needlework and basket-making. It soon became apparent that the children possessed much intelligence and were wonderfully apt with their fingers; they were also very amenable to discipline, and proved therefore in every respect extremely interesting and promising pupils, whose chief fault was found to be the not uncommon one of want of perseverance; nevertheless, during the first year's training the baskets made by the lads and disposed of locally realised Rs. 100, while the girls earned a further sum by their needlework and fancy articles, besides which they made up the clothing for the entire party.

After two or three years' labour in the Orphanage the Kidderpore ladies resigned the charge, and some difficulty was experienced in arranging for the retention of the girls; however some were finally taken by certain residents, who were desirous of training them as servants, while others were speedily married. With regard to the boys the question was less easy of solution, for it was found that those who had been taken in hand at too advanced an age began to pine for a return to their native jungles, and so intense did this desire become, that, in spite of meeting with every discouragement, they were discovered one morning to

<sup>1</sup> *Vide* "Journ. Anthropol. Inst.," vol. xii, No. 40, p. 82.

have settled the matter for themselves by swimming away from the island.

The problem as to how the lads trained in the so-called Orphanage shall be disposed of in some profitable manner has been partially solved by training them to serve as domestic servants; but the question as to their marriage remains yet to be dealt with, for of all the girls originally trained in the Orphanage two only have continued in the Settlement, the other survivors having long since resumed the customs of their jungle homes. To encourage the marriage of the lads in question with girls brought up in the jungle, or even in one of the Homes, would probably result in re-associating, the former with those who—so strong is their general inclination towards a jungle life—would wean them from their civilised ways, thereby rendering abortive the many years' training bestowed upon them, and which has moreover unfitted them for the conditions of a savage home.

It has been ascertained that up to about the age of ten or eleven years these aborigines can hold their own with ordinary children of civilised races in respect to mental culture, but after that period further progress seems arrested. Some remarkable instances might be mentioned of boys and girls<sup>1</sup> who at no more than nine or ten years of age were able to read difficult passages from an Urdu book quite fluently, and explain the meaning of any word in ordinary use; it would appear, however, that, physically speaking, training has a deteriorating effect, for of all the children who have passed through the Orphanage, probably not more than ten are alive at the present time, while of those that have been married, two or three only have become parents, and of their children not one has been reared. In respect to morality, too, it must be confessed that they have suffered from contact with the convict population.

And thus, though the Orphanage, like the Homes, has not accomplished all the good anticipated by its promoters, the kindness and interest taken in their little ones have undoubtedly contributed towards strengthening the friendly relations previously established between the aborigines and ourselves.

Friendly intercourse among the tribes has been of late years further encouraged and extended by visits paid in the station

<sup>1</sup> One of these girls (Ruth) was highly trained by Mrs. Homfray, and is able to speak, read, and write English, as well as to converse glibly in Hindustani. As she has been with us from infancy, it is hardly necessary to say that she is ignorant of her native tongue. Ruth is also an accomplished needlewoman, and is clever at making designs; she wears the European costume, not excepting bonnets and hats. Some idea of the advance she has made on her fellow-countrymen (who are still in the stone age) may be gathered from the above statements, but further proof is found in the fact of her asking for and obtaining a Christmas card album from England, and some lace for the adornment of her dresses!

steamer to the more distant encampments by the officer in charge of the Homes<sup>1</sup> accompanied by males and females of the Southern tribes.<sup>2</sup> On these occasions dogs, iron, beads, and various other articles highly prized by the aborigines have been deposited in the huts from which the occupants had fled, or presented to such individuals as had courage to approach; stringent measures were at the same time taken to check the almost irresistible propensity of the *bō-jig-ngi-ji*- to appropriate all portable property in the temporarily vacated camping grounds.

In these trips Little Andaman has been also visited, but all our efforts to conciliate the *jār-awa*- (or inhabitants of that island) with their offshoot in South Andaman have hitherto proved fruitless. This may in part be due to the summary punishment<sup>3</sup> we have been compelled on two occasions to inflict for cruel murders perpetrated on inoffensive mariners; but it may also be attributable to the exclusiveness and hostility which appear as tribal peculiarities, and which are directed alike against their fellow savages and ourselves, as has been demonstrated by the terror with which they have in recent years inspired the South Andamanese, and in bygone years the Car-Nicobarese,<sup>4</sup> on whom they were formerly in the habit of making raids for purposes of plunder. For a long time now, however, they have desisted from these predatory expeditions, and have confined themselves<sup>5</sup> to the islands and localities which are regarded as their territory; but still, cases have occurred from time to time which keep alive the unpleasant conviction that any unfortunates who might be wrecked, or should venture to land on their coasts without sufficient means of self-defence, would be as mercilessly massacred now as at any date in their history.

The various measures already detailed as having been taken in order to benefit the aborigines have convinced all who have come within their influence of our friendly intentions; even the distant communities of Great Andaman are now becoming as

<sup>1</sup> An account of one of these visits will be found in the form of a private letter which was published in "Journ. Anthropol. Inst.," vol. vii.

<sup>2</sup> Experience has taught us that one of the most effective means of inspiring confidence when endeavouring to make acquaintance with these savages, is to show that we are accompanied by women, as they at once infer that whatever may be our intentions, they are at least not hostile.

<sup>3</sup> A further possible cause of the continued disinclination of the *jār-awa*- to accept our advances is believed to be due to one or more runaway convicts, who may have succeeded in settling in their midst, and who in order to lessen their own chances of recapture and punishment, have given unfavourable accounts of us.

<sup>4</sup> How the *jār-awa*- came to discover the distant low-lying island of Car-Nicobar is not known, but it is probably traceable to some trifling circumstance, such as the accidental drifting of a boat far out to sea.

<sup>5</sup> Vide "Journ. Anthropol. Inst.," vol. xii, "Tribal Distribution," p. 98, and "Communications," p. 113.

well known and as favourably disposed towards us as are our immediate neighbours the *bō-jig-ngī-jī*-, and we have every reason to believe that crews of vessels shipwrecked on any portion of the Great Andaman coast would not only escape molestation and attack, but would receive such assistance as it might be in the power of these savages to render. That their animosity in past years was not unfounded is attested by the reports of Captain Miller and Père Barbe, both of which will be found quoted at some length in the "Journal of the Anthropological Institute" for 1882-3, p. 339.

On referring to the map of the Andamans in the "Journal" of August, 1882 (Vol. II, p. 69), it will be seen that according to our present knowledge<sup>1</sup> the aboriginal inhabitants are divided into no less than nine tribes,<sup>2</sup> viz.:

|                       |    |  |
|-----------------------|----|--|
| <i>bō-jig-ngī-jī</i>  | .. | South Andaman.   |
| <i>bal'awa</i>        | .. | Archipelago.   |
| <i>bō-jig-yāb-</i>    | }  | .. Middle Andaman.   |
| <i>ō-ko-jū-wai-</i>   |    |  |
| <i>ā-kā-ked-e-</i>    |    |  |
| <i>ā-kā-kōl-</i>      |    |  |
| <i>ā-kā-jāro-</i>     | }  | .. North Andaman.  |
| <i>ā-kā-chā-riar-</i> |    |  |
| <i>jār'awa</i>        | .. | Inhabiting Little Andaman<br>and southern portions of Great<br>Andaman. <sup>3</sup> |

Although the *bō-jig-ngī-jī*- are here shown, and in the following pages are described, as the natives of South Andaman—including Rutland and Labyrinth Island—there is no evidence to prove that they have ever been in undisputed possession of the whole of this territory; indeed, the scattered encampments of *jār'awa*-, which are marked on the map as occupying certain portions within their territory give substance to the belief that before our advent they suffered from the inroads of their marauding neighbours, whose occupancy is proved to be of no recent date by the *jār'awa* kitchen-middens,<sup>4</sup> evidently of

<sup>1</sup> How erroneous were the views formerly held may be gathered from the following extracts:—"The Andamans . . . do not even exist in a state of tribedom" (Figuier). "They have no tribal distinctions" (Wood). "In Great Andaman there is only one tribe" (Mouat).

<sup>2</sup> These are the names by which they are designated by the *bō-jig-ngī-jī*-, who, being our immediate neighbours, are the best known of all the tribes.

<sup>3</sup> As these communities possess many, if not all, the characteristics of the inhabitants of Little Andaman, and are presumed to have had constant communication with them in past years, they are designated by the *bō-jig-ngī-jī*- by the name of *jār'awa*.

<sup>4</sup> These are distinguished from those of the *bō-jig-ngī-jī*- with readiness by members of the latter tribe, on account of the presence of the valves of certain molluscs, which they assert were never (according to tradition) considered as articles of diet by their own immediate ancestors.

remote origin, which are found in and near the harbour of Port Blair.

No one who has had the opportunity of seeing the natives of the various islands forming Great Andaman can fail to be struck with the similarity which marks their general appearance,<sup>1</sup> and to be convinced that, however much they may differ in many respects, they must at least claim a common origin. Any reasonable doubt on the subject has been removed by the discovery that although each of the several tribes possesses a distinct dialect, these are traceable to the same source, and are all in the same—*i.e.*, the agglutinative—stage of development; further, it has been ascertained that among all, or at least among the natives of Middle and South Andaman and the Archipelago, a coincidence of legends and customs is to be found, and that though the points of dissimilarity between the inhabitants of Great and Little Andaman are more marked, especially in regard to their weapons and implements, they are by no means such as would justify the belief that the latter are descendants of another branch of the Negrito family.

From what has been already said it will be understood that we are not yet in a position to decide whether one and the same dialect is spoken by all the communities designated as *jūrāwa-*, or whether, like the people of North and Middle Andaman, they must be regarded on linguistic grounds as representing two or more tribes.

The dialects of Great Andaman may be grouped into three classes, viz.:—

- I. The *bō-jig-ngī-ji-* and *bal'awa-*.
- II. The *bō-jig-yāb-* and *ā-kā-kōl-* and *ō-ko-jū'wai-*.
- III. The *ā-kā-ked'e-* and the two tribes of North Andaman.

But it must not be supposed that the similarity between the dialect of any of these groups is so great that a knowledge of one would enable a person to converse intelligibly with members of the other tribes in the same classification, for such is not the case; now, however, that intercommunication is less restricted it is not unusual to find that members of the various communities are sufficiently acquainted with the dialect spoken by their immediate neighbours as to hold intercourse with them.

Little which throws light on their past history can be gathered from the Andamanese or from their traditions, but from a study

<sup>1</sup> I have been told by the *bō-jig-ngī-ji-* that they can distinguish a *bal'awa-* from members of the other tribes by his high cheek-bones, and the shape of his skull, which they describe as more dolichocephalic than those of other tribesmen; but as this tribe is now well-nigh extinct, it is impossible to determine the amount of credence which may be placed on this strange statement.



of their kitchen-middens<sup>1</sup> it appears that they must have inhabited these islands, and have remained in much the same state of barbarism for a very considerable period.

On the assumption that the members of these tribes lived entirely on the coast, it was till recently believed that the kitchen-middens were always situated close to the sea-shore, and it was even said that the accident of their being found far inland would "indicate that some terrestrial changes in the islands have taken place." The incorrectness of this theory is beyond all question, as we have now ample evidence that not only on the coast, but also in the depth of the jungle, there are permanent encampments throughout the group, where we are assured many of these refuse heaps are to be found bearing traces which testify to the remoteness of their origin.

A change, however, appears to be gradually taking place in respect to the formation of these kitchen-middens, which is accounted for by the fact, that whereas in the olden days they were able to regard the slowly increasing heap with pride as witnessing to the success and skill in hunting and fishing of the community near whose encampment it was situated, nowadays all cause for boasting regarding their achievements is considered at an end in consequence of the material assistance they receive from the dogs we have given them, and the superiority (*sic*) of the weapons they have been able to manufacture from iron obtained from the Homes.

Various estimates have been hazarded as to the probable strength of the aboriginal population; but as no reliable data are procurable it is impossible to speak with any degree of certainty on the subject. From recent observations and the ascertained ravages of certain epidemics it seems hardly likely that the aggregate population of Great Andaman at the present day exceeds 2,000 souls, while the *järawa*, who inhabit Little Andaman and a few localities in Great Andaman, may perchance number from 1,000 to 1,500 more; amongst these communities the effect of our occupation cannot have had, as yet, the prejudicial influence which has unhappily resulted among the tribes of Great Andaman from contact with alien races, the causes of which, being noticed elsewhere, need not here be particularised, especially as they are chiefly such as have been found to follow

<sup>1</sup> Col. (now Gen.) H. Man was the first to open up the kitchen-middens in and near the harbour at Port Blair, and the late M. de Roepstorff subsequently devoted some time to their examination, but it does not appear that he has left any notes as to the result of his investigations; at present all that has been published on this subject is embodied in the late Dr. Stoliczka's paper "Note on the Kjökken-möddings of the Andaman Islands" (*vide* Proc. As. Soc. Bengal, January, 1870).

ever in the wake of civilisation to the extermination of the savage race.

In closing this paper it will not, I think, be devoid of interest, even to the general reader, if I append a few particulars regarding Port Blair as the centre of the great Indian penal Settlement.

A glance at the map will show that Port Blair is situated near the south-eastern extremity of Great Andaman, and consists of a fine harbour somewhat *F*-shaped, which extends over seven miles in a south-westerly direction; it contains three islands, Ross, Chatham, and Viper. The first of these, containing an area of about 80 acres, is situated in a commanding position at the mouth of the harbour, and has been the site of the headquarters of the Settlement since its re-establishment in March, 1858; the number of its residents ranges between 2,000 and 3,000, and includes the majority of the civil and military officers, the European troops, and detachments of native infantry and police; the residue consists chiefly of convicts. The Protestant church, Roman Catholic chapel, and a native Christian chapel are on this island.

The second island, Chatham, contains about 12 acres, and is situated midway between Ross and Viper, being visible to both at the bend of the harbour; its population numbers about 500, and is composed for the most part of hospital patients, convalescents, and convicts, who are employed on the steam saw-mills.

Viper, the third island, is about five miles distant by sea from Ross, from which it is hidden by the intervening hills on the so-called "mainland"; its area is slightly larger than that of Ross, but owing to its configuration is not so well adapted for building purposes; the majority of its inhabitants (usually numbering about 1,600 souls) are hospital patients, convalescents, and chain-gang prisoners, these last being confined in the only jail in the Settlement.

Mount Harriet<sup>1</sup> (about 1,100 feet), regarded as the sanitarium of Port Blair, is situated in a commanding position on the north side of the harbour near Chatham Island, and at the eastern extremity of a range of hills running in a northerly direction; its residents are composed of convalescents and weakly convicts and a party of police; round its base, on the western, eastern, and southern sides, various large clearings have been established, barracks and workshops erected, and cultivation and grazing carried on. Similar and more recent clearings exist between Mount Harriet and Port Mouat, where the narrow isthmus (1½ miles wide) dividing the two harbours, though so far distant

<sup>1</sup> It was at the foot of this hill on a dark evening in February, 1872, that the late Earl Mayo, then Viceroy of India, was assassinated (when about to return to the flagship) by an Afriidi convict.

from headquarters, was opened up two or three years prior to the important head-land situated between Ross and Viper Islands.

On the other side of Port Mouat, in a south-easterly direction further tracts of land have been cleared and placed under cultivation connecting that part of the Settlement with the principal clearings in Port Blair, known as the Southern District, being that portion of the mainland which lies west and south-west of Ross Island, where two-thirds of all the self-supporting prisoners and more than half the entire convict population are located.

The cultivation of paddy, sugar-cane, Indian corn, fruits, and vegetables, affords occupation to a large number (at present about 1,500) of a self-supporting population, and further industries of this nature have been opened up—chiefly by means of Government labour—by establishing plantations of cocoanut, tea, Liberian coffee, cacao, nutmeg, limes, arrowroot, *Musa textilis*, India-rubber (*Ceara* and *Hevea*), tapioca, indigo, and vanilla, all of which promise to repay well the care bestowed upon them. Cotton and tobacco have likewise been tried; the cultivation of the former was discontinued long since, apparently on account of the inability of the plants to survive the dry season without great expenditure of labour for watering; with regard to the latter, as failure was due only to ignorance of the proper method of curing the leaves, renewed experiments are being made.

The aggregate population at the present day amounts to about 15,000 of all races; nearly four-fifths of this number, as will be shortly shown, include the convict element, which is distributed among some thirty scattered stations and a like number of villages throughout the entire cleared area; the penal Settlement is thus shown to extend all round the harbour, and to embrace the land at Port Mouat on the west coast.

Following the course of the main road, which now encircles the harbour, a distance of about forty miles would be traversed from its north-eastern extremity to its southern end opposite Ross Island; the number of roads intersecting the Settlement and connecting its various parts is of course considerable, and the importance of keeping them at all times in thorough repair is fully recognised, as is shown by the amount of labour annually devoted for this purpose. In connection with this subject it may be added that intercommunication between the most important points in the harbour has been greatly facilitated in recent years by the establishment of signalling posts at the principal police stations, so that messages can be semagraphed at any hour of the day or night, a matter of no small advantage in cases of emergency so liable to occur in a penal Settlement.

Although the aggregate of the convict population appears large

and capable of ensuring a vast amount of progress in the development of the resources of the country, allowances must be made for the fact of there being but a handful of free servants and labourers in the colony, which necessitates the employment of prisoners in every department; very large deductions have, therefore, to be made on account of those who are ineligible for other than departmental or routine duty, or who from any other cause are not available for Settlement works. This will be better understood when it is explained that about 1,000 men are employed in the Commissariat, Medical, Marine, and Forest Departments; that the self-supporters and servants number about 3,000; hospital patients, the infirm and aged about 1,200; jail servants (or petty officers) about 720; those engaged in manufacturing clothing, in grinding wheat, and in miscellaneous industries 1,400; while of the remaining 4,000 about one-third are required for fixed establishments at the various stations and for conservancy arrangements, the residue being distributed among a vast number of works in all parts of the Settlement.

As in consequence of the continual drain among the self-supporting population on account of deaths and releases their numbers are but slowly increased by the addition of prisoners promoted from the labouring ranks, it must at the present rate of progress be long ere the desire can be realised of the Settlement producing the amount of its requirements even in the one item of rice, while it is certain that wheat, chenna, potatoes, and various other articles of daily consumption—for the cultivation of which the climate is ill-adapted—will always have to be imported; but as a set-off against these it may not be in vain to hope that the day will come when the surplus produce of our cocoanut, tea, Liberian coffee, cacao, nutmeg, and other plantations, together with our exports of timber, will afford substantial compensation by the sums realised in the Indian and home markets. The present average annual cost to Government of every transported convict is believed to amount to about Rs. 105. In proportion as the measures taken to develop the resources and increase the revenue of the Settlement mature, this heavy charge may be reasonably expected to diminish to a material extent.

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ON PHŒNICIAN INTERCOURSE WITH POLYNESIA.

By S. M. CURL, M.D.

(Read on June 24th, 1884.)

HAVING for some time past been gathering available materials with a view to studying the history of Australasia and the islands in the Pacific Ocean, Polynesia, Melanesia, and the Malayan islands, the evidence has accumulated which makes it an established fact, in my mind, that much more intercourse than is generally supposed took place in very ancient times between the continents of Africa, Asia, and America, and the islands lying in the seas and oceans separating these continents.

And the evidences are continually accumulating which prove that not from one centre alone were these islands peopled, but that they received colonists and traders from many different countries. And while these investigations were going on, another set of facts came out clearly which demonstrated that the ancient history of the older peoples would yet have to be rewritten, and then it would be seen, when this history was prepared and printed, that much which is now obscure would then be comprehensible.

But to carry out properly these inquiries I found it would be necessary to study the more ancient writings and languages of the older world; this being done, there came the lights that were wanting, and it was then visible how the people of the earlier times had sailed, traded, colonised, and migrated over great distances of land and ocean.

During the period between 1300–1000 B.C. we find numerous accounts of the Phœnicians sailing down the Red Sea, about the Persian Gulf, over the Indian Ocean, trading around Hindustan, and onwards to what we now know as the Malay islands and seas. There they left their words and written characters, in the neighbourhood of their trading posts. And from this time downwards they continued to trade with Hindustan and Malaysia until the decay of their power. During the time of Necho the Egyptian monarch they made a voyage for him through the Red Sea, round Africa, and home by the Mediterranean.

It will be seen by a comparison of the Rejang alphabet with the English equivalents and values, and the old Phœnician characters and their English values, how these stand in relation to each other. The Lampong characters are somewhat similar to the Rejang characters, but not so carefully made, or showing such a refinement of detail as to have fine or coarse lines made in writing them as in the Rejang, the Rejang thus showing an



advance in the care with which it was written and constructed. It will also be perceived how much more like the characters on bamboo tablets the Lampong is than the Rejang; and if we now turn to examine the similarities between these Sumatran characters and those known as the Phœnician, a critical study of them will enable us to learn at about what time the intercourse between these people took place, so as to enable the one people to transmit their written characters to the other, in the form in which the two sets of characters are found now to most resemble each other.

In the three most ancient forms of the Phœnician with which I am acquainted, there are only to be found certain forms of characters that are comparable with the Sumatran characters, and in these few the resemblance is not very close. But as time and circumstances modify the form of the Phœnician, and at the times when they have given letters to the older Hebrews, we find still greater resemblances: when we come still further down the stream of time, and examine the form of the letters the earliest Greeks got from their Phœnician teachers the resemblance becomes yet closer; and if we examine the Punic characters, as they were written at Carthage in the third century B.C., we shall discover how the Phœnician characters had then been modified. These, and the many other variations and changes that the Phœnician went through as it came past the descending centuries, will enable us to fix the date of the intercourse, trading, and colonisation of the peoples who wrote in these characters and imparted them to the inhabitants of the Malayan lands; and as it would occupy too much space here to exhibit the evidence that would establish this, and as that will be fully set out in my work on these matters, it is merely necessary to state that the evidence shows that in very early times this intercourse went on and continued to times after the Christian era, and that during this protracted period, Shemite, Aryan, Dravidian, Cushite, Egyptian, and Edomite peoples were in communication, and that through Malaysia, Barata, and Mesopotamia intercourse was held with the Papuan, Melanesian, and Polynesian peoples in "the isles of the sea."

## ANTHROPOLOGICAL MISCELLANEA.

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### SOME RESULTS OF THE ANTHROPOMETRIC LABORATORY.

By FRANCIS GALTON, F.R.S.

(See the *Memoir by the same Author at page 205.*)

THE value of the results obtained at the laboratory may be questioned on the ground that the persons who applied to be measured were not random specimens of the crowd who visited the Exhibition, and that the latter themselves were no fair sample of the British population, nor of any well-defined section of it. I have no reply to make to this objection, except that it should not be pushed unreasonably far. On the other hand, it may justly be claimed that results which, taken each by itself, have no great value as absolute determinations, may nevertheless be of considerable importance relatively to one another, by affording materials for testing the relations between various bodily faculties and the influences of occupation and birthplace. Their discussion in any form is a laborious task, and the portion of it that I now submit is very far indeed from exhausting the uses to which the laboratory records can be put. It deals mostly with the very results that I have just spoken of as being the least valuable; but I have taken them in hand first, because it was a necessary preliminary to any further discussion. I also wished to utilise the copious material at my disposal to exemplify what I trust will be found a convenient development of a method of statistical treatment I have long advocated, by presenting in a compact and methodical form (Table II) a great deal more concerning the distribution of the measurements of man than has hitherto been attempted in a numerical form.

The following brief summary of maximum measurements will be interesting:—

9,337 persons were measured, of whom 4,726 were adult males, and 1,657 adult females. The highest records during the whole time that the laboratory was open were those shown in Table I.

TABLE I.

|   | Highest recorded cases among |                         |
|---|------------------------------|-------------------------|
|   | 4,726<br>Adult Males.        | 1,657<br>Adult Females. |
| Height without shoes, in inches .. ..                         | 79.5                         | 70.3                    |
| Weight, in lbs. .. ..   | 308                          | 222                     |
| Breathing capacity, in cubic inches.. ..                      | 354                          | 270                     |
| Strength of pull, in lbs. .. ..                               | 148                          | 89                      |
| Strength of squeeze, in lbs. .. ..                            | 112                          | 86                      |
| Swiftness of blow, in feet per second ..                      | 29                           | 20                      |
| Sight distance, in inches, of reading diamond test-type .. .. | 39                           | 40                      |

The meaning of Table II, and that of the new word "percentile" which is defined in the heading to that Table, will be understood by the help of a single example, for which I will take the line referring to Strength of Squeeze among males. We see that a discussion was made of 519 measurements in that respect, of men whose ages ranged between 23 and 26; that 95 per cent. of them were able to exert a squeeze with their strongest hand (the squeeze was measured by a spring dynamometer) that surpassed 67 lbs. of pressure; that 90 per cent. could exert one that surpassed 71; 80 per cent. one that surpassed 76; and so on. The value which 50 per cent. exceeded, and 50 per cent. fell short of, is the Median Value, or the 50th per-centile, and this is practically the same as the Mean Value; its amount is 85 lbs. This line of the Table consequently presents an exact and very complete account of the distribution of strength in one respect among the middle 90 per cent. of any group of males of the tabular ages similar to those who were measured at the laboratory. The 5 per cent. lowest and the 5 per cent. highest cannot be derived directly from it, but their values may be approximately inferred from the run of the tabular figures, supplemented by such deductions as the Law of Error may encourage us to draw. Those who wish to apply this law will note that the "probable error" is half the difference between the 25th and the 75th per-centile, which can easily be found by interpolation, and they will draw the per-centiles that correspond respectively to the median value *minus* twice, three times, and three-and-a-half times the probable error, at the graduations 8.7, 2.4, 0.8, and those that correspond to the median value *plus* those amounts, at the graduations 91.3, 97.6, and 99.2. The Table is a mere statement of observed fact; there is no theory whatever involved in its construction, beyond simple interpolations between values that differ little from one another and which have been found to run in very regular series.

TABLE II.—ANTHROPOMETRIC PER-CENTILES.

Values surpassed, and Values unreachd, by various percentages of the persons measured at the Anthropometric Laboratory in the late International Health Exhibition.  
(The value that is unreachd by  $n$  per cent. of any large group of measurements, and surpassed by 100- $n$  of them, is called its  $n$ th per-centile.)

| Subject of measurement.  | Age.  | Unit of measurement. | Sex.     | No. of persons in the group. | Values surpassed by per-centa. as below. |              |              |              |              |              |              |              |              |              |
|--|-------|----------------------|----------|------------------------------|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|  |       |                      |          |                              | 95                                       | 90           | 80           | 70           | 60           | 50           | 40           | 30           | 20           | 10           |
|  |       |                      |          |                              | Values unreachd by per-centa. as below.  |              |              |              |              |              |              |              |              |              |
|  |       |                      |          |                              | 5  | 10           | 20           | 30           | 40           | 50           | 60           | 70           | 80           | 90           |
| Height, standing, with-<br>out shoes ...                               | 23-51 | Inches {             | M.<br>F. | 811<br>770                   | 63.2<br>59.9                             | 64.5<br>59.9 | 65.8<br>61.3 | 66.5<br>62.1 | 67.3<br>62.7 | 67.9<br>63.3 | 68.5<br>63.9 | 69.2<br>64.6 | 70.0<br>65.3 | 71.3<br>66.4 |
| Height, sitting, from<br>seat of chair ...                             | 23-51 | Inches {             | M.<br>F. | 1013<br>775                  | 33.6<br>31.8                             | 34.2<br>32.3 | 34.9<br>32.9 | 35.3<br>33.3 | 35.4<br>33.6 | 36.0<br>33.9 | 36.3<br>34.2 | 36.7<br>34.6 | 37.1<br>34.9 | 37.7<br>35.6 |
| Span of arms ...   | 23-51 | Inches {             | M.<br>F. | 811<br>770                   | 65.0<br>58.6                             | 66.1<br>59.5 | 67.2<br>60.7 | 68.2<br>61.7 | 69.0<br>62.4 | 69.9<br>63.0 | 70.6<br>63.7 | 71.4<br>64.5 | 72.3<br>65.4 | 73.6<br>66.7 |
| Weight in ordinary in-<br>door clothes ...                             | 23-26 | Pounds {             | M.<br>F. | 520<br>276                   | 121<br>102                               | 125<br>105   | 131<br>110   | 135<br>114   | 139<br>118   | 143<br>122   | 147<br>129   | 150<br>132   | 156<br>136   | 165<br>142   |
| Breathing capacity ...   | 23-26 | Cubic<br>Inches {    | M.<br>F. | 212<br>277                   | 161<br>92                                | 177<br>102   | 187<br>115   | 199<br>124   | 211<br>131   | 219<br>138   | 226<br>144   | 236<br>151   | 248<br>164   | 277<br>177   |
| Strength of pull as<br>archer with bow ...                             | 23-26 | Pounds {             | M.<br>F. | 519<br>276                   | 56<br>30                                 | 60<br>32     | 64<br>34     | 68<br>36     | 71<br>38     | 74<br>40     | 77<br>42     | 80<br>44     | 82<br>47     | 89<br>51     |
| Strength of squeeze<br>with strongest hand ...                         | 23-26 | Pounds {             | M.<br>F. | 519<br>276                   | 67<br>36                                 | 71<br>39     | 76<br>43     | 79<br>47     | 82<br>49     | 85<br>52     | 88<br>55     | 91<br>58     | 95<br>62     | 100<br>67    |
| Swiftness of blow ...  | 23-26 | Feet per<br>second { | M.<br>F. | 516<br>271                   | 13.2<br>9.2                              | 14.1<br>10.1 | 15.2<br>11.3 | 16.2<br>12.1 | 17.3<br>12.8 | 18.1<br>13.4 | 19.1<br>14.0 | 20.0<br>14.5 | 20.9<br>15.1 | 22.3<br>16.3 |
| Sight, keenness of,—by<br>distance of reading<br>diamond test-type ... | 23-26 | Inches {             | M.<br>F. | 398<br>433                   | 13<br>10                                 | 17<br>12     | 20<br>16     | 22<br>19     | 23<br>22     | 25<br>24     | 26<br>26     | 28<br>27     | 30<br>29     | 32<br>31     |

It may be used in many ways. Suppose, for example, that a man of the tabular age, viz., above 23 and under 26, and who could exert a squeeze of 80 lbs., desired to know his rank among the rest, the Table tells him at once that his strength in this respect certainly exceeds that of 30 per cent. of those who were measured, because if it had been only 79 lbs. it would have done so. It also tells him that his strength does not exceed that of 40 per cent. of the rest, since it would have required a pressure of 82 lbs. to have done this. He therefore ranks between the 30th and the 40th per-centile, and a very simple mental sum in proportion shows his place to be about the 33rd or 34th in a class of 100.

The Table exhibits in a very striking way the differences between the two sexes. The 5th male per-centile of strength of squeeze is equal to the 90th female per-centile, which is nearly but not quite the same as saying that the man who ranks 5th from the bottom of a class of 100 males would rank 10th from the top in a class of 100 females. The small difference between the two forms of expression will be explained further on. If the male per-centiles of strength of squeeze are plotted on ruled paper, beginning with the lowest, and if the female per-centiles are plotted on the same paper, beginning with the highest, the curves joining their respective tops will be found to intersect at the 7th per-centile, which is the value that 7 of the females and 93 of the males just surpass. Therefore, if we wished to select the 100 strongest individuals out of two groups, one consisting of 100 males chosen at random, and the other of 100 females, we should take the 100 males and draft out the 7 weakest of them, and draft in the 7 strongest females. Very powerful women exist, but happily perhaps for the repose of the other sex, such gifted women are rare. Out of 1,657 adult females of various ages measured at the laboratory, we have already seen that the strongest could only exert a squeeze of 86 lbs., or about that of a medium man. The population of England hardly contains enough material to form even a few regiments of efficient Amazons.

The various measurements of males surpass those of females in very different degrees, but in nearly every particular. A convenient way of comparing them in each case is that which I have just adopted, of finding the per-centile which has the same value when reckoned from the lower end of the male series, and from the higher end of the female series. When this has been done, the position of the per-centiles arranged in order of their magnitude are as follows:—Pull, 4; Squeeze, 7; Breathing capacity, 10; Height, 14; Weight, 26; Swiftmess of blow, 26; Keeness of sight, 37. We conclude from them that the female differs from the male more conspicuously in strength than in any other particular, and therefore that the commonly used epithet of "the weaker sex" is peculiarly appropriate.

The Table was constructed as follows:—I had groups of appropriate cases extracted for me from the duplicate records by Mr. J. Henry Young, of the General Register Office. I did not care to



have the records exhausted, but requested him to take as many as seemed in each case to be sufficient to give a trustworthy result for these and certain other purposes to which I desired to apply them. The precise number was determined by accidental matters of detail that in no way implied a selection of the measurements. The summarised form in which I finally took them in hand is shown in the two upper lines of the following specimen :—

*Height, Sitting, of Female Adults, aged 23-50, in inches.*

| 29- | 30- | 31- | 32- | 33- | 34- | 35- | 36- | 37- |                             |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------------------------|
| 2   | 8   | 52  | 116 | 226 | 227 | 108 | 31  | 5   | Total<br>775                |
| 2   | 10  | 62  | 178 | 404 | 631 | 739 | 770 | 775 | Abcissæ<br>0 to 775         |
| 30  | 31  | 32  | 33  | 34  | 35  | 36  | 37  | 38  | Corresponding<br>Ordinates. |

The meaning of the two upper lines is that in a total of 775 observations there were 2 cases measuring 29 and under 30 inches, 8 cases measuring 30 and under 31 inches, and so on. The third line contains the sums of the entries in the second line reckoned from the beginning, and is to be read as follows :—2 cases under 30 inches, 10 cases ( $=2+8$ ) under 31 inches, 62 cases ( $=2+8+52$ ) under 32 inches, and so on.

I plotted these 775 cases on French "sectional" paper, which is procurable in long and inexpensive rolls, ruled crossways by lines 1 millimetre apart. I counted the first line as  $0^\circ$  and the 776th as  $775^\circ$ . Supposing the measurements to have been plotted in the order of their magnitude, in succession between these lines, the first would stand between  $0^\circ$  and  $1^\circ$ , the second between  $1^\circ$  and  $2^\circ$ , and so on. Now we see from the Table that the second measurement was just short of 30 inches, consequently the third measurement was presumably just beyond it, therefore the abscissa whose value is  $2^\circ$ , and which separates the second from the third measurement, may fairly be taken to represent the abscissa of the ordinate that is equal to 30 inches exactly. Similarly, the abscissa whose value is  $10^\circ$  divides the measurement that is just under 31 inches from that which is presumably just above it, and may be taken as the abscissa to that ordinate whose precise value is  $31^\circ$ , and so on for the rest. The fourth line of the Table gives the ordinates thus determined for the abscissæ whose values are entered above them in the third line. I dotted the values of these ordinates in their right places on the sectional paper, and joined the dots with a line, which in every case, except the breathing capacity, fell into a

strikingly regular curve. (I shall speak further on about this one partial exception.) Per-centiles were then drawn to the curve, corresponding to abscissæ that were respectively 5 per cent., 10 per cent., 20 per cent., &c., of the length of the base line. As the length of the base line was 275, these per-centiles stood at the graduations  $13.8^\circ$ ,  $27.5^\circ$ ,  $55.0^\circ$ , &c. Their values, as read off on the sectional paper, are those which I have given in the Table.

It will be understood after a little reflection that the 9th rank in a row of 10, the 90th rank in a row of 100, and the 900th rank in a row of 1000, are not identical, and that none of them are identical with the 90th per-centile. There must always be the difference of one half-place between the post which each person occupies in a row of  $n$  individuals, numbered from 1 to  $n$ , and that of the corresponding graduation of the base on which he stands, and which bears the same nominal value, because the graduations are numbered from 0 to  $n$  and begin at a point one half-place short of the first man, and end at one half-place beyond the last man. Consequently the graduations corresponding to the posts of the 9th, 90th, and 900th man in the above example, refer to the distance of those posts from the beginning at 0 of their several base lines, and those distances are related to the lengths of the base lines in the proportions of  $8.5 : 10$ , of  $89.5 : 100$ , and of  $899.5 : 1000$ , which when reckoned in per-cents. of the several base lines are 85, 89.5, and 89.95 respectively. The larger the number of places in the series, the more insignificant does this half-place become. Moreover, the intrusion of each fresh observation into the series separates its neighbours by almost double that amount, and propagates a disturbance that reaches to either end, though it is diminished to almost nothing by the time it has arrived there. We may therefore ignore the existence of this theoretically troublesome half-place in our ordinary statistical work.

There is a latent source of error that might affect such statistics as these, as well as many others that are drawn up in the usual way, which has not, so far as I know, been recognised, and which deserves attention. It is due to uncertainty as to the precise meaning of such headings as 30-, 31-, &c. If the measurements, no matter whether they were made carefully or carelessly, are read off from the instruments with great nicety, then a reading such as 30.99 would fall in the column 30-, and the mean of all the entries in such a column might fairly be referred to a mean value of 3.50.

But if the instruments are roughly read, say to the nearest half inch, the reading of a real instrumental value of 30.99, and even that of a real value of 30.76, would both be entered in the column 31-. The column 30- would then contain measurements whose real instrumental values ranged between 29.75 and 30.75, and the column 31- would contain those that ranged between 30.75 and 31.75; consequently, the means of all the entries in those columns

respectively should be referred, not to 30.5 and 31.5, but to 30.25 and to 31.25. Thus an error of a quarter of an inch in the final results might easily be occasioned by the neglect to note and allow for the degree of minuteness with which the instruments were read. No multiplication of measurements would get rid of it, neither would any increase of care in setting the instruments nor any increase in their accuracy. The error of which I speak is purely dependent on the degree of minuteness with which the instruments are read off. I strongly suspect that many statistical tables are affected by this generally unrecognised cause of error. The measurements at my laboratory were read to the nearest tenth of an inch and to a fraction of a pound, so I can afford to disregard this consideration. There was, however, a slight bias in favour of entering round numbers, which should have been, but were not (because I neglected to give the necessary instructions), rateably divided between the columns on either side.

I will now make a few remarks upon the measurements severally, and give some extracts from the numerous MS. tables already prepared, which I propose ultimately to present to the Anthropological Institute, together with the original laboratory records. They will form a valuable addition to those now in their possession, made by the Anthropometric Committee of the British Association, if utilised in connection with future inquiries into the influences of occupation and birthplace.

#### HEIGHT, STANDING *and* SITTING, *and* SPAN of ARMS in ADULTS.

A compendious view of the chief linear measurements of the persons examined is afforded by the three data: (1) height standing (without shoes); (2) height when sitting, measured upwards from the seat of the chair; (3) the span of the extended arms measured from the extreme finger tips. From these we can infer with approximate and adequate accuracy the lengths of the trunk, legs, and arms, and the proportion they severally bear to the total stature.

#### *Height Sitting, and Span.*

The ratio between height sitting and span varies as is well known during the period of growth, and is different in tall and short adults. The following table shows the relation between the two in persons of both sexes of approximately medium stature, who are between the ages of 23 and 51.

| HEIGHT SITTING. |                                       |   | SPAN.   |                                       |   |
|-----------------|---------------------------------------|---|---------|---------------------------------------|---|
| Inches.         | Males.<br>Height 5 feet<br>8½ inches. | Females.<br>Height 5 feet<br>3½ inches. | Inches. | Males.<br>Height 5 feet<br>8½ inches. | Females.<br>Height 5 feet<br>3½ inches. |
| 31-             | ..                                    | 1                                       | 60-     | ..                                    | 3                                       |
| 32-             | ..                                    | 7                                       | 61-     | ..                                    | 4                                       |
| 33-             | ..                                    | 39                                      | 62-     | ..                                    | 31                                      |
| 34-             | 4                                     | 42                                      | 63-     | ..                                    | 23                                      |
| 35-             | 31                                    | 11                                      | 64-     | ..                                    | 19                                      |
| 36-             | 44                                    | ..                                      | 65-     | 1                                     | 10                                      |
| 37-             | 19                                    | ..                                      | 66-     | 2                                     | 3                                       |
| 38-             | 2                                     | ..                                      | 67-     | 3                                     | ..                                      |
| ..              | ..                                    | ..                                      | 68-     | 12                                    | ..                                      |
| ..              | ..                                    | ..                                      | 69-     | 18                                    | ..                                      |
| ..              | ..                                    | ..                                      | 70-     | 27                                    | ..                                      |
| ..              | ..                                    | ..                                      | 71-     | 22                                    | ..                                      |
| ..              | ..                                    | ..                                      | 72-     | 10                                    | ..                                      |
| ..              | ..                                    | ..                                      | 73-     | 3                                     | ..                                      |
| ..              | ..                                    | ..                                      | 74-     | 1                                     | ..                                      |
| ..              | ..                                    | ..                                      | 75-     | 1                                     | ..                                      |
|                 | 100                                   | 100                                     |         | 100                                   | 100                                     |

*Height, Sitting and Standing.*

As regards the ratio between height sitting and standing, it does not appear that a moderate increase of tallness in males is associated with a disproportionate increase of length of legs, the ratio of height sitting to height standing being uniform up to 6 feet or more. Its value is 54 : 100 ; in other words, the ratio of their legs to their trunk is 46 to 54 or thereabouts. When the stature exceeds 6 feet, the length of the legs as compared to that of the trunk increases notably ; but my cases are too few to warrant a numerical estimate. As regards females, the case is curiously different. Here an increase of stature is from first to last accompanied by an increase of the length of legs as compared to that of trunk. The data calculated as above are as follows :—For a female stature of 4 feet 10½ inches it is as 45 : 55, for 5 feet 2½ inches 46 : 50, and for 5 feet 6½ inches it is as 47 : 53. As regards taller females, my data distinctly point to a rapid progression in the rate of increase of the relation in question.

*Weight.*

As regards weight, I have nothing more to say at present.

*Breathing Capacity.*

The returns show a remarkable regularity in the alteration of the breathing capacity as life advances. It increases rapidly in early youth, and becomes stationary between the ages of 20 and 30

or a little later, and thenceforward steadily declines. I have already alluded to the existence of some irregularity in the run of the per-centiles of breathing capacity, in adults aged from 23 to 51. This is chiefly due, I think, to an unequal representation of the various ages between those limits, and to the somewhat irregular mixture of town and country folk, and of sedentary and active professions among the persons measured.

The following brief abstract gives a very fair epitome of the returns:—

AVERAGE BREATHING CAPACITY  
(in cubic inches).

| Ages. | Males. | Females. |
|-------|--------|----------|
| 10    | 135    | 121      |
| 15    | 199    | 138      |
| 20    | 216    | 142      |
| 25    | 217    | 137      |
| 30    | 213    | 137      |
| 35    | 211    | 136      |
| 40    | 203    | 123      |
| 45    | 194    | 119      |
| 50    | 191    | 118      |
| 55    | 178    | 111      |

The superior breathing capacity of the male is partly related to his stature and bulk; it is little in excess of that of females in early life, but becomes half as great again at the age of 20, and that large ratio is more than maintained throughout the whole of the after life.

*Strength of Pull and Squeeze in Adults.*

The strength of squeeze, as indicated by the instrument, does not keep ahead of that of pull at the highest end of the scale. The difference between them falls off, and is even reversed in the higher figures. I ascribe this wholly to the fault of the instrument, which does not permit the hand to act throughout with the same advantage. The more nearly it squeezes the bars together, the more it closes upon itself, and the less advantageously do the muscles act. It is easy to contrive an adjustment that might offer a similar grip in all cases, but it is not easy to construct one that shall act without additional loss of time. I have thought of a grip that should be forced by a steady increasing pressure, the strain at the moment of forcing it being registered automatically.



*Strength of the Right and Left Hands.*

I had a batch of about 500 cases of males between the ages of 23 and 51 analysed to determine the relative strength of the right and left hands. Out of every 100 cases about 50 had the right hand strongest; 20, or rather more, had the left hand strongest; and in 30 the strength was the same. A single line out of the table will give a good idea of the whole. The total of the cases to which it refers was only 82, but for the convenience of percentages I have raised it to 100.

| Squeeze of the right<br>hand (in lbs.)<br>75-80. | Squeeze of the left hand (in lbs.) |     |     |     |     |     |     |     |     |     | Total<br>cases. |
|--|------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------------|
|  | 50-                                | 55- | 60- | 65- | 70- | 75- | 80- | 85- | 90- | 95- |                 |
|  | 1                                  | 1   | 6   | 9   | 26  | 27  | 21  | 6   | 2   | 1   |                 |

On the average of all the cases the left hand appears to be about 6 per cent. weaker than the right hand.

While the figures were accessible, I thought it as well to see if by chance there existed any relation between the superior strength of the right or left hand and the superior reading power, as explained farther on, of the right or left eye. There was absolutely none. Had I had means to compare the inferior skill of the right or left hand, which I had not, the existence of some relation would be less improbable.

*Strength of Squeeze and Breathing Capacity.*

I was surprised to find that there is no close relation between strength of squeeze and breathing capacity. As the measurements are peculiarly trustworthy, being all made with the same instruments and by the same observers, I give the records in full to establish the fact. The importance of a large breathing capacity to a man who expends force rapidly, as to a runner or a mountain climber, is undoubted, but for a strain of short duration it seems comparatively non-essential. Still, I should have thought it to have been more nearly connected with every form of strength than it is. The table shows that an increase of breathing capacity from 150 to 300 inches is accompanied by an increase of strength of squeeze from an average of 75 lbs. to not more than 92 lbs. That is to say, when the breathing capacity is double, the strength of squeeze is on the average only one quarter greater.

BREATHING CAPACITY AND STRONGEST SQUEEZE.—Males, age 23, 24, and 25.

| Breathing capacity. | STRONGEST SQUEEZE IN LBS. |     |     |     |     |     |     |     |     |     |     |      |      |      |      | Total. |
|---------------------|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|--------|
|                     | 45-                       | 50- | 55- | 60- | 65- | 70- | 75- | 80- | 85- | 90- | 95- | 100- | 105- | 110- | 115- |        |
| Cubic inches.       |                           |     |     |     |     |     |     |     |     |     |     |      |      |      |      |        |
| 70-80               | ..                        | ..  | ..  | ..  | 1   | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | 1      |
| 80                  | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | 1   | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 90                  | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 100                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 110                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 120                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 130                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 140                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 150                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 160                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 170                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 180                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 190                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 200                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 210                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 220                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 230                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 240                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 250                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 260                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 270                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 280                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 290                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 300                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 310                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 320                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 330                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| 340                 | ..                        | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..   | ..   | ..   | ..   | ..     |
| ..                  | ..                        | ..  | 5   | 9   | 26  | 49  | 80  | 88  | 91  | 67  | 60  | 28   | 14   | 5    | ..   | 522    |

*Eyesight.*

The light at the laboratory was rarely sufficient, and it was very variable, since the tests were carried on partly in the daytime, partly when the light was waning, and partly during the evening illumination. The absolute results are therefore of little importance, though they are worth recording, namely, that one quarter of the males of various ages who were able to read small print at all without glasses, were able with one eye to read pages taken from the well-known little shilling prayer-book, printed in diamond type, at a greater distance than 27 inches, one-half of them at a greater distance than 22 inches, and three-quarters at a greater distance than 18 inches. No person at the laboratory succeeded in reading a page further off than 38 inches, though one lady at my own house, probably under better light and using both her eyes, unmistakably exceeded 41 inches.

Though the tests are of little importance absolutely, they are of much value relatively in comparing the power of the two eyes, as to whether on the whole the right eye is stronger than the left, or *vice versa*, and what is the average difference between their powers. It appeared from an examination of about 850 cases that the number of those whose two eyes were equally effective bore the ratio of 2 to 3 (or a very little more than 3) to the number of those in whom the powers of the two eyes differed to a notable degree. It also appeared, on taking the average of all the 850 cases, that the difference between the greatest reading distance of the two eyes with the above test type, was just 2 inches (or the merest trifle less). And lastly, it appeared that the average strength of the right and of the left eyes was almost exactly the same. Thus with the right eye there were 253 cases in which the greatest reading distance lay between 20 and 24 inches, and with the left eye there were 256 such cases; again, when the greatest distances lay between 25 and 29 inches, the cases were 229 and 224 respectively.

I have nothing of novelty to say regarding the colour sense, as the data, although they have been tabulated, have not yet been discussed.

*Highest Note Audible.*

The measurements were made with five whistles set to emit 10, 20, 30, 40, and 50 thousand vibrations per second respectively. Notwithstanding the roughness of the measurements, the results fall into a very fair curve; however, it would be hardly justifiable to give per-centiles, because the values on which the curve is based are wide apart. I therefore limit myself to giving a table of the actual observations reduced to percentages for the convenience of comparison. It will be seen here, as in every other faculty that has been discussed, the male surpasses the female; 18 per cent. of the males hear the shrillest test-note, as against 11 per cent. of the

females, and 34 per cent. of the males hear the next shrillest test-note, as against 28 per cent. of the females.

|           | Ages. | Percentage of cases in which the under-mentioned number of vibrations were perceived as a musical note. |        |        |        | Number of Cases. |
|-----------|-------|---|--------|--------|--------|------------------|
|           |       | Number of vibrations per second.  |        |        |        |                  |
|           |       | 20,000  | 30,000 | 40,000 | 50,000 |                  |
| Males. {  | 23-26 | 99  | 96     | 34     | 18     | 206              |
|           | 40-50 | 100   | 70     | 13     | 4      | 317              |
| Females { | 23-26 | 100   | 94     | 28     | 11     | 176              |
|           | 40-50 | 100   | 63     | 8      | 1      | 284              |

On COMPOSITE PHOTOGRAPHS of SKULLS.

By DR. BILLINGS, Curator, Army Medical Museum, United States.

(Extracts from a letter to Mr. F. Galton, relating to the Photographs exhibited at the Meeting of the Institute on November 11th, 1884.)

"WAR DEPARTMENT, SURVEYOR-GENERAL'S OFFICE,

"WASHINGTON, D.C., October 28th, 1884.

"I have the honour to forward to you by mail to-day a few specimens of composite photographs illustrating the application of your suggestion of that mode of illustration to the subject of craniology. These composites have been made directly from the crania themselves, and not by combining different photographs. I have satisfied myself that this method bids fair to be of great importance in craniological studies, permitting a comparison of crania in different collections more satisfactorily than any system of measurements which has yet been devised.<sup>1</sup>

"JOHN S. BILLINGS,

"Surgeon U.S. Army."

LIST OF PHOTOGRAPHS SENT.

Composite photograph of seven adult male *Sandwich Islanders'* Skulls, side view; Nos. 425, 444, 442, 445, 446, 438, 286, Section IV, a.m.m. Wet process, exposure 70 seconds.

<sup>1</sup> See Memoir by Mr. Galton, "On the Application of Composite Portraiture to Anthropological Purposes." Report of the British Association, 1881, p. 690.

Composite photograph of seven adult male *Sandwich Islanders' Skulls*, front view; Nos. 425, 444, 442, 445, 446, 438, 286, Section IV, a.m.m. Wet process, exposure 70 seconds.

Composite photograph of seven adult *Negro Skulls*, front view; Nos. 980, 411, 955, 949, 953, 979 954, Section IV, a.m.m. Beebe's gelatin dry plate, exposure 3 seconds.

Composite photograph of eight male *Ponca Indian Skulls* (adult), side view; Nos. 836, 837, 835, 834, 831, 487, 486, 877, Section IV, a.m.m. Beebe's gelatin dry plate, exposure 3 seconds.

Composite photograph of eight male adult *Ponca Indian Skulls*, front view; Nos. 836, 837, 835, 834, 831, 487, 486, 877, Section IV, a.m.m. Beebe's gelatin dry plate, exposure 3 seconds.

Composite photograph of seven adult male *White Skulls*, Nos. 6306<sup>3</sup>, 7023, 6305, Section I; 63, 2118, 2119, 38, Section IV, front view, Beebe's gelatin dry plate, exposure 3 seconds.

Composite photograph of seven adult male *White Skulls*, Nos. 6306<sup>3</sup>, 7023, 6305, Section I; 63, 2118, 2119, 38, Section IV, a.m.m. side view. Beebe's gelatin dry plate, exposure 3 seconds.

Composite photograph of eighteen adult male *Cheyenne Indian Skulls*, Nos. 5560, 6525, Section I; 526, 2061, 528, 8, 715, 149, 146, 150, 1762, 9, 913, 464, 2121, 2090, 2035, 773, Section IV, a.m.m., side view. Beebe's gelatin dry plate, exposure 1½ seconds.

Composite photograph of seven adult male *Sandwich Islanders' Skulls*, base view, Nos. 425, 442, 444, 445, 446, 438, 286, Section IV, a.m.m. Beebe's gelatin dry plate, exposure 3 seconds.

Composite photograph of seven adult male *Sioux Indian Skulls*, base view, Nos. 483, 793, 792, 1119, 665, 330, 816, Section IV, a.m.m. Beebe's gelatin dry plate, exposure 1 second.

#### THE YAHGANS OF TIERRA DEL FUEGO.

EXTRACT from a LETTER addressed to Prof. Flower by the REV. THOMAS BRIDGES, of the South American Missionary Society, dated Ooshooia, Fireland, August 24th, 1884.

"You will perhaps be glad to have a few particulars of the physical state of these natives (the Yaghans). Among them are great differences of appearance, stature, bulk, and features. Whilst generally the hair is lank, you not unfrequently see wiry, short, frizzy hair; while most are wan and cadaverous, not a few have a decided rouge on their cheeks, especially the women. The people are invariably stout in their trunk, having little or no narrowing at the waist, and are short-necked, deep-chested, and of a vigorous frame. But in these particulars there are all degrees, some being even in health decidedly slender. In limbs, upper and nether, they are small, and their hands and feet are smallish. Work and change of life have an immediate effect upon their physique, resulting in fine muscular limbs, and hands fit for a blacksmith. In the



hair there are many shades of black, many having a reddish yellow tinge. Also their face-hair varies greatly, though generally they may be described as beardless. As regards the time of puberty, it is greatly retarded by hardship and forwarded by plenty. Some are as well developed at thirteen as others at eighteen or even nineteen years. Features vary greatly as well as complexion, and the hue of the person depends upon whether covered or exposed. Some have flat and very wide noses to an ugly degree, and others again are the reverse. With many the eyes have the Chinese dip, but in many this cannot be traced. The colour of the eyes varies from light hazel to deep black. I have never heard of an albino. The height of the men varies from 5 feet 2 inches to 5 feet 9 inches. Well-developed eyebrows and eyelashes are frequently seen, but as a rule they are more or less scarce. Animal life is very scanty in this country, and the natives are certainly not more than a third of what they were some thirty years ago. The Yahgans, according to a census I made in June, are as follows: men, 273; women, 314; children, 358; total, 945."

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ON THE SO-CALLED WORKED FLINTS FROM THE MIOCENE BEDS OF  
THENAY, IN FRANCE.

At the recent Congress of the French Association for the Advancement of Science at Blois, the Anthropological Section (presided over by M. Ernest Chantre, the eminent anthropologist of Lyons) discussed with much fervour the question of the existence of man in the Tertiary age, as exemplified by the tertiary deposits of Thenay, a village some twelve miles from Blois. These deposits have been made famous by the labours of the late Abbé Bourgeois, who in 1867, before the Congress of Præhistoric Archæology at Paris, made known his discovery in them of some small and rudely-chipped flints whose workmanship he attributed to the hand of man.

Some of the flints found in these beds have apparently been subjected to great heat, causing a crackled appearance on the surface; this also has been attributed to man's agency, and shows his knowledge of fire.

The proximity of Thenay to Blois gave an admirable opportunity to the members interested in præhistoric anthropology to see and examine for themselves this now well-known deposit.

Monday, the 8th of September, was fixed for the visit, and about forty members availed themselves of the occasion.

Among them were well-known geologists and anthropologists, such as M. Cotteau, a former President of the Geological Society of France, M. Fuchs, M. d'Ault, M. E. Chantre, M. Cartailhac, and others.

In order to facilitate the examination of the ground, and in the

absence of suitable natural sections, trenches had been opened some few days previously, under the competent superintendence of Messrs. D'Ault and Dalleau.

These showed the order of the various beds, and their particular characteristics. A careful examination indubitably established the early Tertiary age of the beds from which the late Abbé Bourgeois had obtained his specimens. The only hesitation seemed to be whether they should not be classed as Eocene, where they have been placed by M. Douvillé, the author of the government geological map of the district.

On all hands it was conceded that these clays with flints (where the crackled flints and those showing signs of human workmanship had been obtained) could not be younger than Early Miocene.

Thus the age of the beds in question seems to be conclusively settled, but the difficult and perplexing problem as to the cause of the marks of fire and *retouches* upon the flints caused an animated discussion, not only upon the spot, but when in session at Blois.

Suggestions were offered that the crackled appearance of the flints might be due to some physical cause, such as that of the action of thermal waters, of which there is evidence in the locality. Again, exception was taken to the want of experimental evidence of the action of heat and pressure in various forms upon the flint nodules.

After much discussion, the President proposed, and the meeting resolved, that laboratory experiments should be made in the manner suggested by M. Boulé, and M. Cartailhac was asked to assist in the work.

The balance of opinion, as expressed at the meetings, seemed to be against the acceptance of the evidence afforded by the Thenay deposits, as any support to the doctrine of Tertiary man.

Notwithstanding the minute search of forty members, only two pieces of flint were obtained having marks of the same character as those collected by the Abbé Bourgeois.

Most English anthropologists will probably lean to the opinion expressed by M. Cotteau, "that to admit man's existence so long before the extensive deposit of the lacustrine limestones of Beauce, a long time before the disappearance of the *Dinotherium*, a long time before the sea of the 'Faluns' had invaded the country and changed its configuration, would need proofs much more convincing than a few small flints, rare even in collections, without any definite use, wanting the bulb of percussion, and only offering, as an indication of intentional work, some unequal and irregular chipping (*retouches*), and which are due doubtless to chance."

MARK STIRUP.